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ABSTRACT

Thirty-six nonreading children aged four and five years old participated in a study comparing the ease of learning words represented in traditional orthography (T.O.) and in three logographic systems: Carrier-Peak, Bliss, and Rebus. (The Carrier-Peak symbols, normally moveable abstract shapes, were converted to graphic form for the study.) The subjects, randomly selected from four day care centers in a midwestern metropolitan area, were assigned to one of four experimental conditions: Carrier-Peak, Bliss, Rebus, or T.O. Fifteen words, randomly selected from the pool of 26 words common to all four graphic systems, were presented to subjects in individual 15-minute sessions in which they were shown the words on stimulus pages, told what they were, and then asked to say them as the examiner pointed to them on response pages. Analysis of the results indicated that the three logographic systems were significantly easier to learn than T.O., that the partially iconic logographies (Bliss and Rebus) were significantly easier to learn than the noniconic logography (Carrier-Peak), and that the Rebus system was significantly easier to learn than the Bliss system. (The treatment pages used with all four groups are reproduced.) (GW)

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RESEARCH REPORT #107

Contract No. 300-76-0036

A COMPARATIVE STUDY OF YOUNG CHILDREN'S EASE OF LEARNING
WORDS REPRESENTED IN THE GRAPHIC SYSTEMS OF REBUS, BLISS,
CARRIER-PEAK, AND TRADITIONAL ORTHOGRAPHY

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RESEARCH, DEVELOPMENT AND DEMONSTRATION CENTER IN EDUCATION OF HANDICAPPED CHILDREN

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The University of Minnesota Research, Development and Demonstration Center in Education of Handicapped Children has been established to concentrate on intervention strategies and materials which develop and improve language and communication skills in young handicapped children.

The long term objective of the Center is to improve the language and communication abilities of handicapped children by means of identification of linguistically and potentially linguistically handicapped children, development and evaluation of intervention strategies with young handicapped children and dissemination of findings and products of benefit to young handicapped children.

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Chapter 1

INTRODUCTION

Graphic systems other than alphabets are being utilized more frequently in instructional situations and research with children and adults. Graphic systems are systems that are "comprised of a rule-governed set of visible marks that provide a means of linguistic inter-communication" (Clark & Woodcock, 1976, p. 552). Recently there has been an interest in the use of such nonalphabetic systems as logographies, in which a character may:

- 1) represent a morpheme, the smallest unit of meaning in language (Gleason, 1961),
- 2) represent a word consisting of one or more morphemes, or
- 3) be compounded as a word to represent one or more morphemes.

Logographic systems, other than Chinese, are used in the United States primarily in situations in which traditional orthography (T.O.) is impractical for certain individuals to use or is too difficult or too time-consuming to acquire. Instructional materials and techniques of various types have been designed employing logographies with preschool children and beginning readers. Logographic systems have also been used as aids to communication and in language training with handicapped individuals.

Despite the increasing use of these logographies, there is little information available on the comparative ease of learning words represented in the different systems. Such information is needed since logographic systems vary widely in word representation. In some systems, for example, symbols (or characters) are primarily pictographic and meaningful, while in other systems they are completely abstract and offer no clue to meaning. Thus, one particular logography may lend more ease than another to the learning situation.

To date, no comparison among the more widely used logographic systems and T.O. has been made to document which type or types might be easiest for children to learn. The few studies that have been conducted with such systems have been limited to comparisons between two logographies or between one logography and T.O.

Purpose of the Study

The purpose of the present study was to compare with pre-school, nonreading children, the ease of learning a sample of 15 words represented in four different graphic systems. These systems include traditional orthography, and three logographic systems; Carrier-Peak, Bliss, and Rebus.

In referring to individual units of the three logographic systems (Carrier-Peak, Bliss, and Rebus) the term "symbol" will be used instead of "sign," despite the fact that some readers

may view one or two of the logographies as "sign" systems. The use of the term "symbol" is in keeping with the terminology commonly applied to the three logographies by their creators (Bliss, 1965; Carrier & Peak, 1975; Woodcock, 1958, 1965, 1968a, 1968b) and by users of the systems.

Background of Major Graphic Systems

Until about 3100 B.C. there were no writing systems (Gelb, 1963). Before that time, crucial knowledge and archival information were memorized and transmitted orally from generation to generation, their continuity dependent upon the memory of the transmitter. When entire tribes or civilizations became extinct, so did most of their histories. With the advent of writing systems, however, it became possible for human knowledge to transcend time and space (Fromkin & Rodman, 1974). Today technological societies have become highly dependent on graphic systems for communication and for the maintenance and continuation of records. For these societies, graphic systems are so vital that one of the primary tasks of childhood is to learn to read in the accepted system.

The two major forms of writing used in the world today are alphabets and logographies (Gelb, 1963). Alphabets, which are the most widely used, consist of a few graphemes (letters) that can be combined in various patterns to represent the spoken language of a society. In the traditional orthography

of English-speaking countries, for example, the Roman alphabet of 26 letters can be permuted to represent all the sounds and sound-combinations of English. A predominately logographic system such as Chinese, on the other hand, is one that requires hundreds of characters (logograms) to represent the language (and requires many years to learn) (Ullman, 1963). In logographies, the characters usually have meaning (morphemic) referents rather than sound (phonemic) referents as do alphabets (Kollers, 1969).

Alphabetic systems, because of their small number of symbols are much more efficient than logographic systems when representation of an entire language is considered (Diringer, 1942; Gelb, 1963). Despite the efficiency of alphabets, their use does not assure that children will learn to read their language easily. Instead, the orthography of a language (in addition to certain intellectual abilities) tends to influence the ease of acquiring the decoding skills necessary for reading (Lotz, 1972). Finnish, for example, which also uses the Roman alphabet, has a relatively phonemic and predictable orthography, that is, each grapheme usually represents only one phoneme (Bolinger, 1968). Learning the decoding process for reading Finnish is not particularly difficult and is usually accomplished in the first year of formal instruction (Lotz, 1972; Venezky, 1973). Learning the decoding process for reading English, however, normally requires several years of intensive instruc-

tion. For the novice reader it is not a system which is easily acquired. A number of children in English-speaking countries have difficulty learning to decode in the preferred system of T.O.

Traditional Orthography

A glance at the history and changes of English orthography during the past several centuries illuminates some of the origins of unpredictable spelling patterns. The English language acquired written form only after Britain was Christianized by the Romans in 597 A.D. The Roman alphabet was used to represent the written form of English, and many words were "borrowed" gradually from Latin and added to the language (Baugh, 1957). Through the centuries, "borrowing" has occurred from other languages, also. The Scandinavian invasions of Britain eventually left English peppered with new words, however, Baugh (1957) postulated that the most profound effect on the language was the Norman Conquest of 1066. At this time French became the language spoken at court and by the upper classes in England, while English was considered the language of the lower classes. Not until the middle of the 13th century did English generally become used again among the upper classes. When people who had been accustomed to using French, tried to express themselves in written English, they transferred many French words into the English language and retained the French orthography.

Another form of "borrowing" occurred during the Renaissance when there was a revival of interest in Greek and Latin. The Latin and Latin-Greek origins of many English words had been obscured through time by normal changes in pronunciation and spelling (Falk, 1973). Well-meaning scholars felt that these origins should be reflected once again in the orthography of the time. Thus, they attempted to change the spelling of numerous English words. In some cases letters were inserted where they were never pronounced such as the "s" in "aisle" or "island" (MacLeish, 1970). Similar tampering resulted in the addition of the "b" in "doubt." The word "doubt" originally was borrowed from the French as "doute." The Latin form of this word was "dubitum." Since the Latin form contained a "b," some scholars felt that the English word should, also; hence, "doubt" with an unpronounced "b" (Falk, 1973).

Not all silent letters in words, however, were the results of "borrowing." At one time, a great number of what are now unpronounced graphemes actually did represent sound segments, but as the oral language changed over time, the orthographic form did not keep pace (Gleason, 1961). For example, in the Old English period of history (450 A.D. - 1150 A.D.) the sound segment "gh," as in the word "fight," was pronounced like the German sound segment [X] "(as in German buch, [bux] 'book')"

(Falk, 1973, p. 130). When this sound died out of the oral language, its spelling remained in the written language as

silent letters when followed by "t." When "gh" is not followed by "t," it sometimes sounds like an "f" ("laugh," "enough"), and sometimes it is silent as in "bough," "through" and "high."

Despite these many additions and changes, several authorities on orthography (Chomsky, 1970; Chomsky & Halle, 1968; Venezky, 1970) believe that the English orthographic system is close to being optimal for the representation of standard spoken English. This is due to its ability to reveal the underlying morphophonemic system rather than just the surface system. However, Chomsky (1970) noted, "the exact form of this underlying system is based on consideration of learned words and complex derivational patterns" (p. 16). Therefore, until a child is well along in the process of learning to read, has internalized complex derivational rules for morphemes and words, and has developed certain strategies for remembering how to pronounce particular graphemes and grapheme combinations, the written language would seem to offer many unpredictable orthographic patterns that may be attributed to "borrowing" and to the slow pace of orthographic change in relation to oral language change.

The problem, frequently called "irregularity" in phoneme-grapheme correspondences, is thought by some to be so devastating to the beginning reader that orthographies which are more phonemically regular than T.O., as well as other graphic systems, have been designed for use in the early stages of

reading and in language instruction. The rationale for "regularizing" English spelling derives from the fact that there are between 40 and 46 phonemes in the language (depending upon various dialects) and only 26 graphemes to represent the phonemes (Gleason, 1961).

Alphabets such as the Initial Teaching Alphabet (i.t.a.) devised by Sir James Pitman in 1959 from an earlier and similar alphabet, offered 44 characters to represent most of the phonemes of English (Pitman & St. John, 1969). Malone (1962), who developed the 40-character UNIFON alphabet, used with beginning readers, originally designed UNIFON for total orthographic reform. Other attempts at orthographic simplification for young children have resulted in the utilization of colored letters to represent sounds (Bannatyne, 1968; Gattegno, 1969), diacritical markings (Fry, 1964) and various other types of elaboration in T.O.

Total orthographic reform has been advocated for several centuries, even during the time that "borrowing" and tampering with Latin-based words was occurring. In 1569 John Hart published an orthography to reform the spelling of his time (Pitman & St. John, 1969). Ben Franklin developed a reformed alphabet in 1786, and George Bernard Shaw, who was devoted to spelling reform, left a large portion of his estate to a trust for the simplification of the alphabet (Fry, 1965). These are but a few of the many who have suggested reforms. To date

none of the suggestions has been successful in changing the orthography, but indirectly, each has been successful in stimulating interest in graphic systems which are alternatives to T.O.

Logographies

Logographic systems may have several advantages over alphabetic systems for certain purposes and with certain populations. An example given by Falk (1973) of the Chinese situation illustrates the point. The spoken language in China has a variety of forms or so-called dialects such that speakers of one dialect do not understand speakers of other dialects. For example, the speaker of Mandarin who says [lin] meaning "woods" does not understand the Cantonese version of "woods" which is [lain]. Not only is the pronunciation different, but the stress and tone vary from dialect to dialect. The feature, however, which permits communication across dialects and throughout China is the logographic writing system which all literate Chinese can comprehend. An analogy to this situation may be drawn with monolingual Europeans of several different countries. The logographic equation $3 + 4 = 7$ can be read and comprehended by peoples of all European countries, but when the equation is read aloud by a Frenchman, it is not understood by most Germans, or Spaniards, or Italians. Such is the case with dialects in Chinese. If China totally adopted

an alphabet, the two forms of "woods" given above would probably be spelled differently. Hence, a logography, though cumbersome to learn because of the vast number of symbols, does have a potential advantage for any population characterized by widely variant dialects.

Another advantage of logographic systems, particularly newly developed ones, such as those presented in this study, is that they can be learned and used for partial language representation much more quickly with pre-elementary age children than can T.O. (Woodcock, 1968a). This provides a useful graphic system during the preschool years, or for individuals who may never be proficient in an alphabetic system. Logographies may also be used for communication in place of speech by handicapped individuals such as the cerebral palsied who have difficulty speaking or using manual communication (McDonald, 1976; McDonald & Schultz, 1973; Vanderheiden & Harris-Vanderheiden, 1976).

Logographies were the earliest examples of writing systems. Of the seven known systems which existed, only Chinese remains in use today (Falk, 1973). Although a large portion of the symbols in a writing system may be logographic, and the system is called a logography, there are not currently, nor have there probably ever been any pure logographic systems used to represent an entire language; instead, these systems were logosyllabic in nature (Antilla, 1972; Gelb, 1974; Langacker, 1968).

That is to say, because of the enormous number of symbols needed to represent a language, most of the ancient logographies also employed a syllabary (a set of symbols, each of which represents a syllable). This allowed many symbols to be used dually for a word or a syllable, thus, reducing the number of symbols required to represent the total language. Modern Chinese also utilizes a small syllabary; hence, it is not a pure logography.

Gelb (1963) has distinguished six different classes of logograms in ancient systems that partially coincide with the modern classification of Chinese, and with the logographic systems, Carrier-Peak, Bliss, and Rebus to be studied in this paper. The six classes proposed by Gelb progress in complexity from the simplest devices for representing spoken language to the most complex. This classification system provides a common method for comparing the characteristics of different logographies. Gelb's classes are:

1. the "primary" class,
2. the "associative" class,
3. the "diagrammatic class,
4. the "semantic indicator" class,
5. the "phonetic transfer" class,
6. the "phonetic indicator" class.

Primary Class. The first class consists of symbols "expressed by drawing a picture of a concrete object, which stands for a concrete object or action" (Gelb, 1963, p. 251). For example, a drawing of a sun might be used as the symbol for

the word "sun;" the symbol for "rain," a drawing of a sky plus rain drops.

Associative Class. These symbols "express words connected with the original drawing by association of meanings" (Gelb, 1963, p. 99). A drawing of the sun might mean "sun" and also have the secondary meaning of "day" or "bright."

Diagrammatic Class. Symbols in this class are geometric forms. In the Egyptian script a vertical line meant "one"; a circle in Summerian script meant "totality" or "all." These symbols were not completely devoid of referents. Gelb believed that many diagrammatic logograms such as the Summerian "all" were developed from the gesture language of the day. The gesture for "all" may well have been a circular motion of the hand.

The first three classes of symbols, primary, associative, and diagrammatic consist of simple devices that can accomodate the primitive needs of a written language but are inadequate for expressing more exact nuances. Thus, as ancient logographies evolved, new expressive devices were added.

Semantic Indicator Class. The fourth class of logograms involves the attaching of a semantic but non-phonetic "determinative" (which may or may not be a word) to the basic symbol to help interpret its exact meaning. For example, in the Egyptian system the symbol "lord" could mean "man" or "diety." A semantic indicator or determinative designating "man" was attached to the symbol "lord" producing the symbol "lord-man"

meaning human "lord." A determinative indicating "deity" was attached to the symbol "lord" to mean divine "lord." In time, determinatives were attached to words to indicate a certain class rather than a specific meaning.

Phonetic Transfer Class. With the introduction of this class of logograms, a new type of writing system began to evolve in ancient logographies. "Phonetic transfer" is commonly referred to as the "rebus principle," a principle that capitalizes upon homophones (words that sound alike but have different meanings such as "rose" and "rows") to represent words that are difficult to portray in a drawing. A pictogram showing "wood" might represent both the words "wood" and "would." A pictogram representing "bee" might also represent the word "be." (With the advent of phonetic transfer, syllabic representation using the same principle evolved into logo-syllabic systems. A logogram for "bee" and one for "leaf" could be used to represent the word "belief." Hence phonetic rather than morphemic referents were used.)

Phonetic Indicator Class. The sixth class of logograms consists of adding a phonetic but non-semantic element to a symbol to aid in its interpretation. Modern Chinese has many examples of these phonetic compounds. Usually two characters in Chinese are involved; a "radical," an element that hints at the meaning, and an element called the "phonetic" that hints at the sound (Martin, 1972). The logogram for a tree called

"pine" might be a symbol for "tree" (the radical) plus a symbol for "pupis" (the phonetic) whose pronunciation approximates that of "pine." The words "elm," "oak," and "cedar" might all have the same radical but different "phonetics" depending upon each pronunciation.

Gelb (1963) remarked that only in borrowed systems of writing is there a class of symbols not based on any of the six classes discussed above. Such a class of symbols Gelb has labeled "allograms" and has included "logographic, syllabic, or alphabetic signs [symbols] or spellings of one writing when used as word signs or even phrase signs in a borrowed writing" (p. 105). An alphabetic example of this, offered by Gelb, is the English interpretation of the Latin "et cetera" to mean the phrase "and so on, and so forth."

History and Description of the Three Logographies

Gelb's classification system just presented will be utilized to compare the composition of the three logographies of interest to this study: Carrier-Peak, Bliss, and Rebus. A note of caution from Gelb (1963) is applicable to these logographies. He stated:

It is impossible to divide the signs [symbols] rigorously within the classes because some signs may belong to different classes or they may be formed by means of more than one device. (p. 99)

The three logographic systems from which samples are examined in this study are quite different in the degree of

iconicity their symbols offer. (The term "iconic," in this study, refers to the physical resemblance of a symbol to that which it represents.) Yet their symbols, for the most part, fit into Gelb's six classes of logograms. Although all three systems are open-ended and can have any number of new symbols added to them, the present materials represent only a few words of the language. Hence, none of the systems is a full writing system. The Carrier-Peak symbols represent less than 50 words, the Bliss symbols (from the source used in this study) less than 600, and the Rebus symbols less than 2100 words. Furthermore, the systems lack the ability at present for full representation of a language. Their respective sets of symbols, nevertheless, are systematic in partially representing language and language forms and provide, within limits, a means of linguistic intercommunication among system users.

Carrier-Peak Symbols

The Carrier-Peak symbols are those symbols employed in the Non-SLIP, Non-Speech Language Initiation Program by Carrier and Peak (1975). The original symbols are moveable abstract plastic shapes used to form linguistic patterns in much the same manner as one might use printed words on cards. Although the plastic shapes usually are not represented graphically, they were adapted to printed form for comparative purposes in the present study.

Berry, & Baker, 1976; Hughes, 1974/75; Velletri-Glass, Gassaniga, & Premack, 1973); and retardation (Carrier, 1974a; Carrier, 1976; Parsons & Carrier, 1971; Schmidt, Carrier, & Parsons, 1971).

Premack's highly structured, step-by-step program was partially replicated successfully by Schmidt, Carrier, and Parsons (1971) with severely retarded children. Carrier then devised his own abstract symbols, which were also geometric shapes but are more similar to each other than Premack's geometric forms. He also developed a nonoral program especially for retardates (Carrier, 1974a). The symbols and procedure have since been refined to the present Non-SLIP program (Carrier & Peak, 1975).

The Non-SLIP program utilizes a total vocabulary of 34 words. The white plastic symbols which represent the words, are coded with a small patch of color to indicate class or position in a sentence. In addition to color, the word is printed in T.O. on the symbol. During training the plastic symbols are placed on a tray which has seven separate marked areas representing positions of specific words in a sentence. Although Carrier and Peak do not mention the close similarity of their sentence training format to that of the Fitzgerald Key (Fitzgerald, 1949), designed for use with hearing impaired individuals, the similarity is evident in Fitzgerald's "who," "what," "when," "where" sentence format.

The Non-SLIP program was designed for "pre-language" in-

The Carrier-Peak symbols and the training technique in which they are utilized, are patterned after Premack's (1970, 1971) moveable, abstract shapes cut from sheets of plastic, and employed originally in training procedures with the chimpanzee, Sarah. Sarah was taught, by means of operant behavior techniques, to communicate with her trainers by receiving and producing a variety of nonvocal sentence patterns which were formed using the moveable abstract shapes in her 130-word plastic vocabulary. Sentences were built in vertical columns on a magnetized board (Premack & Premack, 1974).

The abstract, manipulable forms of various shapes, colors, and textures were completely noniconic to the objects, actions, and concepts they represented (Premack & Premack, 1974). The shapes had several advantages in Premack's training procedure; 1) they required only gross motor movement, 2) they served to control attention in the subject who was required to arrange the metal-backed words in sentences on the magnetized board, 3) a spatial system, rather than a temporal system such as speech or sign language, could be used to circumvent short term memory, and 4) such a system allowed the experimenter to modulate the difficulty of the task (Premack & Premack, 1974). The Premackian-type program has been applied in nonvocal artificial language training with several other chimpanzees and with humans of varying types of handicaps, such as autism (McLean & McLean, 1974; Premack & Premack, 1974); aphasia (Gardner, Zurif,

struction. Carrier (1976) stated that the program "focuses on teaching a child tactics for learning language rather than teaching a circumscribed set of 'functional' communicative responses" (p. 529). Hence, stress is on correct placement of symbols in a syntactic pattern rather than on logical meaning of the sentence. The Non-SLIP kit consists of: 1) the "Program Manual" containing the philosophy and rationale of the program, 2) the plastic symbols, 3) the sentence tray, 4) the "Program Instruction Cards," 5) picture cards, 6) word cards, and 7) data sheets.

Examples of symbols from all three logographies (Carrier-Peak, Bliss, and Rebus) are compared in Figure 1 using Gelb's (1963) six classes of logograms, and his "allogrammatic" class. Many of the symbols do not fit perfectly or exclusively into Gelb's classes; instead there may be some overlap from class to class or a very general application made of Gelb's definition in a particular class.

All of the 34 Carrier-Peak symbols qualify unquestionably for Gelb's diagrammatic class. Figure 1 presents samples of the forms which in no way resemble their referents. Other symbols could be designed to expand the Non-SLIP vocabulary, but in all probability, they would follow the design tenor of the original Carrier-Peak symbols and therefore, fall also into the diagrammatic class.

GELB'S CLASSES OF LOGOGRAMS	LOGOGRAPHIC SYSTEMS								
	CARRIER-PEAK			BLISS			REBUS		
PRIMARY				 bed	 bird	 chair	 bed	 bird	 chair
				 girl	 grass	 lady	 girl	 grass	 lady
				 man	 table	 tree	 man	 table	 tree
ASSOCIATIVE									
DIAGRAMMATIC	 bed	 bird	 chair	 is	 all +	 will	 is	 all	 will
	 girl	 grass	 lady	 thing	 with	 and	 thing	 with	 and
	 man	 table	 tree						
SEMANTIC INDICATORS				 coat, sweater	 dress	 pants	 elves	 leaves	 men
				 I, we, my	 you, your	 she, her	 wolves	 women	
				 he, him	 opposite	 towel			
PHONETIC TRANSFER							 bee, be	 can, can(v)	 wood, would
							 to, too	 camp	 catatonic
							 bike	 arm showmanship	
PHONETIC INDICATOR									
ALLOGRAM				 circle	 dog	 guinea pig	 hat	 pinch	 strand

Figure 1. A comparative display of Carrier-Peak, Bliss, and Rebus symbols using Gelb's classes of logograms.

Bliss Symbols

Charles K. Bliss designed the Bliss symbol system while in China during the early 1940's. He was impressed by the fact that, although the Chinese frequently did not understand the spoken dialects of neighboring provinces and regions, they could communicate with each other through the logographic writing system (Bliss, 1965). This prompted Bliss to develop a system of his own which might be used for international communication. The system has many of the logographic characteristics of Chinese.

Originally called "Semantography," the symbol system according to Bliss (1965) "is proposed as a practical tool, as an auxilliary writing for communication purposes between different nations" (p. 101). The symbols are "intended for practical purposes, short reports, etc....not for fiction or poetry" (p. 108).

Bliss symbols were not employed regularly with children until they were adapted for use with cerebral palsied individuals by a Canadian teacher. They are currently employed primarily on communication or language boards for non-oral communication; with this usage, the T.O. counterpart of the Bliss word is always printed beneath the symbol so that those unfamiliar with the Bliss system can comprehend the message (Harris-Vanderheiden, Brown, MacKenzie, Reinen, & Scheibel, 1975; McNaughton, 1976). At present there are no materials

for use by individual learners other than the language board implementations nor are there specific step-by-step programs available for teaching the symbols or for teaching language.

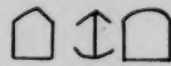
For the present study, the Bliss symbols were taken from the Teaching Guideline of the Ontario Crippled Children's Centre Symbol Communication Research Project (1974). This guideline employs many of Bliss's original symbols, but has modified a number of them, and added many new symbols. The Teaching Guideline presents: 1) an instruction guideline, 2) suggestions for drawing the symbols, 3) syntax pointers, and a dictionary of approximately 465 words and odd symbols, and, 4) an appendix containing a color code for vocabulary display as well as matrices of symbols.

The Bliss system contains approximately 100 basic symbols which generally represent concepts and words rather than morphemes. The term "concept" as applied here means that a form may be used to represent several different words with similar meanings. For example, "I," "me," and "my," all utilize the same symbol combination that means "first person." The words "coat" and "sweater" also have the same compound (see Figure 1) that means "clothing over." Most of the vocabulary is comprised of compounds formed with the 100 basic symbols. The compounds also represent mostly concepts and words.

The combinations are made in such a way that rules and procedures for the order or sequence of the combinations must

be learned. Usually, a classifier is the first symbol in the compound. In the word "school," for example, the classifier is the symbol "building" followed by the symbols "give" and "knowledge." The word "teacher" consists of the classifier "person" plus "give" plus "knowledge." See Figure 2 for these combinations. Compounds which deal with similar topics have common components (McNaughton, 1976). Types of features are shown in Figure 2. For some words or concepts, the features are physical; for example, the word "television" is a combination of the single symbols "enclosure," "eye," "ear," and "electricity." The word "light" is the compound of "sun" and "eye." In some words the features are affective. The word "afraid" is a combination of "sad" ("emotion" plus "down"), "future," and "question." The word "happy" consists of the symbols "emotion" plus "up." Other less obvious types of features are employed in other words, and at times combinations of features are utilized such as for the word "pet," which is a compound of "animal" (physical) and "heart" or "emotion" (affective), and the word "friend," a compound of "person" and "like."

Size, and vertical position of the symbol in relation to a horizontal line, figure prominently in word meaning. For example a large circle means "sun;" a small circle means "mouth." A large "plus" sign means "add," a small one means "and," "also," and "too." A small "plus" sign positioned in

Classifiers

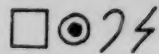
school



teacher

Features

Physical

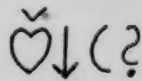


television



light

Affective



afraid



happy

Combined

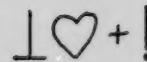

 pet
 (animal + emotion)

 friend
 (person + like)

Figure 2. Examples of classifiers and types of features in Bliss symbol combinations.

the center between two horizontal lines divided by space means "and," etc. This same "plus" sign positioned on the bottom line indicates possession, and when positioned on the top line means "with the help of."

From illustrations in the Teaching Guideline, it appears that, in sentential use, the system does not always employ grammatical strings. The sentence "Why didn't you go?" is written "Why you not go?". This syntax is probably not confusing or difficult for a child with adequate receptive language even with the exclusion of "did" in the latter sentence. Furthermore, the use of abbreviated syntax is more expeditious on communication boards (Vanderheiden & Harris-Vanderheiden, 1976). The nongrammatical usage may not be suitable, however, in language instruction for the child whose syntactic rules are not well developed.

Many of the basic symbols in the Teaching Guideline fall into Gelb's primary class of pictograms. These symbols, however, are highly stylized. They are noniconic except by previous knowledge of their identity. Figure 1 shows a comparison of primary class Bliss symbols with the more iconic Rebus symbols. Some words that are in the primary class in Rebus fall into other classes in the Bliss system. The converse is true of primary class Bliss words.

It would appear that no Bliss symbols qualify precisely for inclusion into Gelb's associative class. There are several

symbols with dual or multiple meanings, but there are no primary symbols with secondary meanings as defined by Gelb.

Approximately 25 symbols from the Teaching Guideline are diagrammatic in nature. Figure 1 presents examples of Bliss symbols falling within this third class of Gelb's.

A large number of Bliss symbols overlap from the primary and diagrammatic classes into the semantic indicator class. This class includes symbols that serve to indicate meaning and to indicate specific classes. The compound Bliss symbols in Figure 1 represent examples of determinatives or indicators added to classifiers to indicate meaning. In the word "coat" or "sweater" for example, the determinative is the symbol for "over" added after the word "clothing." The word "dress" is a combination of the symbol "clothing" plus the determinative "lady"; the word "pants" is the combination of "clothing" plus "legs." In the pronouns shown in Figure 1, the determinatives are the numbers "1," "2," and "3" indicating first, second or third when added to the symbol "person" and "lady" and so on. Also functioning as a determinative to meaning is the "opposite" symbol (see Figure 1) which is used with other symbols to indicate the opposite meaning. The word "towel," for example, shown in Figure 1 consists of the symbols "cloth," "opposite," and "water." The second type of determinative (see Figure 3), that is, an indicator of class, is added to other symbols to indicate part of speech, plurality, possession, tense, and

Class Indicators or Determinatives

1. Part of Speech (used only when needed for clarification)

					
noun (thing)	verb	adjective, adverb	man	to man	manly

2. Plurality Indicator

					
plural	many, much	I, me	we	you	they

3. Possession Indicator

						
's	mine	yours	his	hers	its	ours

4. Tense Indicator

			
present	past	future	likes (present + like)

5. Voice Indicator

			
active	passive	cuts	is cut by

Figure 3. Class indicators and examples of their use in the Bliss system.

voice. The noun indicator, for example, in Figure 3 is placed over another symbol to change the word to a noun. An inverted "v" over a symbol converts the word to a verb; an upright "v" converts the word to an adjective or adverb. The plurality indicator is placed over a singular symbol to convert it to plural status. Examples of possession, tense, and voice usage are also shown in Figure 3.

No Bliss symbols fall into the phonetic transfer class or into the phonetic indicator class, however a few appear in a loosely defined "allogram" class (see Figure 1). The looseness of this class has to do with borrowing letters from the Roman alphabet and attaching them to logograms rather than borrowing entire words as Gelb suggested. Nevertheless, this classification seems suitable to a small number of Bliss symbols listed in the Teaching Guideline. Types of animals are distinguished by attaching the first letter of the name of the animal to the Bliss word for "animal." Thus "horse" is the symbol "animal" plus an "H." Words for geometric shapes are distinguished from other words employing the same symbol by having a "G" (for geometric) attached to the symbol. In this way, the word "sun", which is a circle, is distinguished from the word "circle" which is a circle with a "G" attached. In the Bliss system, the key to vocabulary enlargement is in knowing the rules for using determinatives or indicators with: 1) the appropriate classifiers, or 2) to convert a word to another

part of speech. The use of indicators with classifiers as in the words "coat" (clothing over), "dress" (clothing lady) or "pants" (clothing legs) and others is not necessarily exclusive to the Bliss system. Any graphic system could be employed if it were necessary for combinations such as these. The important element in a system of this type is knowing what concepts to combine.

Rebus Symbols

Pictograms are often referred to by laymen as "rebuses." The term "rebus" comes from the Latin "res" which means "thing." ("rebus" is the ablative plural form.) Webster's New Collegiate Dictionary (1974) defines "rebus" as "a representation of words or syllables by pictures of objects or by symbols whose names resemble the intended words or syllables in sound" (p. 963).

Rebuses have been used for a variety of purposes. Logograms, mostly in the form of rebuses, are utilized widely as international symbols for equipment controls, road signs, and signs in public places. In these situations rebuses usually represent more than one word. Dreyfuss (1972) has compiled a number of such symbols in his Symbol Sourcebook. Puzzles also use rebuses. Almost everyone is familiar with the type of puzzle in which a series of pictures sometimes interspersed with letters and connected by plusses and minuses, results in a word or sentence when correctly solved.

Partial utilization of rebuses was popular in many 19th century reading texts and children's books, where rebuses (in conjunction with T.O.) were used for lexical items not yet in the reading vocabularies of their users. Huey (1908/1968) recommended the use of rebuses for reading and writing with preschool children, stating that it was a natural way for a child to begin to read and "draw" "and a method that I am inclined to think will be more and more used in beginning to read" (p. 329).

Partial utilization of logograms in early reading has continued into the 20th century. The Harper and Row Basic Reading Program (O'Donnell, 1966), for example, used picture symbols in some of its preprimers to expand the vocabulary. The i.t.a. series (Tanyzer & Mazurkiewicz, 1966) also used rebuses in its beginning books for the same purpose.

Total utilization of rebuses, however, to represent the complete text of reading materials has been limited. Nevertheless, some materials have been designed and employed with learners. One of the first tests utilizing a complete rebus text was devised by Woodcock (1958) to predict success in remedial reading. Woodcock (1965) later designed one of the first beginning reading programs which used a complete rebus text, The Rebus Reading Series. This was an experimental basal reader program in which children began reading with a vocabulary of rebuses that were gradually transliterated into

T.O. The program was designed to replace the readiness, pre-primer, and primer levels of a traditional T.O. basal reading program. An outgrowth of this program is the Peabody Rebus Reading Program (Woodcock, Clark, & Davies, 1969). This is a partially programmed beginning reading program which uses a vocabulary of logograms (rebuses) as a link between spoken language and the discrete morphemic patterns of language in print before it introduces the learner to some of the more difficult phonemic patterns of T.O. The rebuses are gradually put into a T.O. transition, so that, by the end of the program the learner is ready for the primer level of a traditional reading program.

Rebuses have also been used in language instruction. The Minnesota Early Language Development Sequence (MELDS) (Clark, Moores, & Woodcock, 1975) is a receptive language program designed for hearing impaired children with little or no knowledge of English. Using a multimodality approach, MELDS combines the spatial logographic system of rebuses and the temporal system of signed English (American sign language presented in English sentence patterns) with the speech mode, in presenting a step-by-step structured sequence of syntactic patterns and vocabulary. The purpose of the program is not to teach the eventual reading of T.O., but rather to help the child build a linguistic foundation so that English sentence patterns can be comprehended. Hence, very few words are trans-

literated into T.O.

A set of materials employing a rebus syllabary has been designed by Gleitman and Rozin (1973) to teach beginning readers that the writing system "tracks the sound stream" of English. The syllabary makes use primarily of the "rebus principle" or "phonetic transfer" in syllabic form. In the Gleitman and Rozin materials each rebus has a T.O. word printed beneath it.

The rebus symbols used for the present study were taken from the Standard Rebus Glossary (Clark, Davies, & Woodcock, 1974). The Glossary includes over 2,000 rebus words derived from 818 individual rebus symbols, combinations of rebuses, and letters combined with rebuses. This system provides a one-to-one match of printed language to oral language. The Glossary presents: 1) the history and research of rebuses; 2) specific suggestions for using rebuses in language instruction, reading instruction, speech correction and therapy, and on communication boards for the nonoral individual; 3) the complete alphabetical listing of rebuses; and, 4) special word lists of animals, clothing, food, parts of the body, family members and occupations, home-related words, sports-related words, and words opposite in nature.

Most of the individual rebuses in the Glossary represent single "free" morphemes, that is, units of meaning which can stand by themselves as words such as, "girl," "turn," "lady"

or "help." In a few instances, however, a single rebus stands for two morphemes such as the words "airplane," "cowboy," and others as depicted in Figure 4. Inflectional morphemes ("s," "'s," "ed," and "ing,") are represented in T.O. and attached to the rebus (see Figure 4).

Of the 818 individual rebuses in the Standard Rebus Glossary, well over half fall into Gelb's first class, primary symbols. These are iconic drawings of concrete objects and actions (see Figure 1).

There are no rebuses in the Glossary that fall comfortably into Gelb's associative or second class, a class in which a symbol has secondary meanings associated to the original drawing.

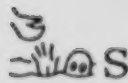
Into the third or diagrammatic class (symbols created freely from various geometric forms), it is possible to place only about 10 of the rebuses. These symbols are purely diagrammatic and have no semantic referents as seen in Figure 1.

Only a small number of rebuses may be placed suitably into Gelb's fourth class, semantic indicators. These rebuses represent the plural form of irregular nouns, and depict the singular symbol in triplicate as shown in Figure 1.

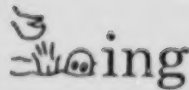
The fifth class, phonetic transfer or the rebus principle includes approximately 40 per cent of the 818 individual rebuses in the Glossary. Most symbols of the 40 per cent, however, are also in the primary class. This overlapping condition occurs because of the use of homophones in the phonetic

Inflected Rebuses

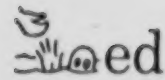
33



helps



helping



helped

Compound Words Using Single Rebuses



airplane



cowboy



grandmother

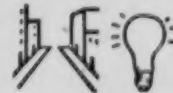
Compound Words Using Compound Rebuses



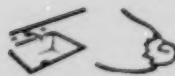
doghouse



sunflower



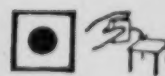
streetlight



sinkhole



become



input

Figure 4. Examples of inflected Rebus words, and compound words employing single Rebuses and employing compound Rebuses

transfer class. Thus, the primary class Rebus word "bee", a drawing of bee, becomes a word in the phonetic transfer class when the symbol is used for the word "be." This fifth class also includes about 850 two-morpheme compound words; and a few words which utilize the rebus principle in multi-syllabic form. One such word is "catacomb" as shown in Figure 1. The single rebuses are words which can be used for two or more parts of speech such as noun and verb, and others (see Figure 1). They are depicted, however, to best portray both or several parts of speech whenever possible, or to portray in the most concrete form the most frequent usage of the word with children. The symbol "camp," for example as shown in Figure 1 represents equally well the verb "camp" and the noun "camp;" the symbol "bike" has the same equality of representation. The symbol "arm" on the other hand, (see Figure 1) does not equally represent the body part "arm" and the act "to arm." Since the latter form "to arm" is used less with children, the symbol "arm" depicts a body part. According to the rebus principle, the symbol is acceptable for both the noun and verb forms.

The published rebus programs, the Minnesota Early Language Development Sequence and the Peabody Rebus Reading Program use three or less symbols utilizing phonetic transfer since it is a more advanced form than Gelb's previous classes. Instead, these programs employ primarily concrete representation of words whenever possible.

Abstract lexical items such as "be," "would," "can," "too," are depicted in Figure 1. Compound rebuses, as shown in Figure 4, which utilize phonetic transfer, tend to fall into two sub-classes: 1) those with combined drawings suggestive-of-meaning, 2) those with combined drawings non-suggestive-of-meaning. The depiction of the rebus words "doghouse," "sunflower," and "streetlight" all suggest meaning, whereas "sinkhole," "become," and "input" do not.

No rebuses qualify for placement into Gelb's sixth or phonetic indicator class. The closest type of representation to this class is the "semi-phonetic" word in which a reader is introduced to the partial phonemic breakdown of words. This involves borrowing from the Roman alphabet hence, this group of words will be termed loosely "Allograms" (see Figure 1), following Gelb's definitions cited earlier. The semi-phonetic word is an optional use of previously-learned rebuses combined with letters to form words. For instance, instead of using the pictogram for the word "hat," one could represent the word by the letter "h" plus the rebus "at" (see Figure 1). "Pinch" could be represented, as shown in Figure 1, by the letter "p" plus the rebus "in" plus the letter combination "ch." This use provides the learner with an introduction to the phonemic segmentation of words, the logical step to follow sentence segmentation into word units.

Although the particular source is limited to approximately

2100 symbols from which the rebuses for this study were taken, there is no limit to the number that conceivably could be designed to further represent the English language. Anyone in fact, can design rebuses, and many people have done so for a number of centuries, for a variety of purposes, and for use with several different methods of teaching.

As may be seen in comparative examples of the three logographic systems in Figure 1, the Rebus system appears to be the most iconic, the Carrier-Peak system the least iconic, and the Bliss system partially iconic, but also the most complex because of its heavy use of the semantic indicator class. Although these logographies are vastly different constitutionally, they all have been applied successfully as aids to learning. Nevertheless, one might predict that systems that utilize to a great extent simple devices such as those in Gelb's first three classes would be easier to learn than systems that utilize mostly the latter three classes. Furthermore, one might expect differences to exist even among systems utilizing the simple devices since some systems are more iconic than others.

Review of the Research Literature

Most of the research literature addressed to utilizing logograms in instructional situations has been written within the past fifteen years. Although the body of literature is small, and for the most part, is descriptive in nature, it

does indicate an increasing awareness of the value of logographic systems for communication and for the early stages of instruction in language and reading. Few of the studies, however, have involved the investigation of iconic or partially iconic logographies (such as the Rebus and Bliss systems). The majority of studies have looked at logograms that are noniconic. For the most part, the studies have investigated logograms derived from the work of Premack (1971).

The initial success of Premack's language system with chimpanzees was followed by numerous attempts to investigate the value of such a logographic system for individuals who were deficient in language. The majority of studies dealing with the use of logograms in education have employed some modification of Premack's procedure. Generally, they have utilized operant behavior techniques, and in most instances, have used abstract logograms that are similar to Premack's. These studies have used Premackian-like systems and noniconic symbols with a wide range of subject populations.

Two studies have demonstrated that such symbols can be utilized for communication with adults when T.O. or oral language is not processed effectively. Velletri-Glass, Gazzaniga, and Premack (1973) described the acquisition of elements of a nonvocal, artificial language by seven, post-stroke, global aphasic subjects. Initially the subjects, ranging in age from 59 to 84 years, had no functional expressive language

capabilities, had limited receptive abilities and could not write spontaneously or from dictation. Subjects could discriminate CVC (consonant-vowel-consonant) words from nonwords, but, for the most part, had no semantic knowledge of the words, and could not read longer words or connected discourse of any length.

Training consisted of a modification of Premack's procedure, plus the use of noniconic logographic symbols of various sizes and shapes cut from colored paper and arranged from left-to-right on a table top. The training procedure and, in part, the lexicon were geared to the interest of the individual patient. Constructions included "same-different", (e.g., A?A or A?B, in which the subject was taught to remove the interrogative symbol and substitute either the "same" or "different" symbol) the interrogative, negation, and simple declarative sentences. Words were taught by associating a symbol with an object, action, or agent during a simple social transaction. The authors stated that subjects were successful in attaining various simple linguistic constructions using the logographic symbols. Two of the subjects progressed to about 80% accuracy in comprehension and productivity. No data were reported nor were amount and duration of training time given. Although this study was designed primarily to determine if certain logical capacities were maintained following cerebral damage, and was not designed specifically to explore the basis of a func-

tional communication system, it demonstrated, nevertheless, that logograms can be employed effectively to foster elements of communication when T.O. and oral language cannot.

Another study using logograms with adults was reported recently by Gardner, Zurif, Berry, and Baker (1976). These authors attempted to establish and examine a framework for functional communication among five adult aphasics who possessed little or no ability to communicate using natural language. Gardner, et al. departed from Premack's use of abstract shapes and employed instead both iconic and noniconic logograms drawn in black ink on 3x5 index cards. These were manipulated by the subjects. Conjunctions and prepositions were drawn on half-sized index cards.

The nonoral procedure was similar to Premack's (1971) except that production required the subject to construct messages spontaneously in a socially appropriate situation, such as "I want matches" for lighting a cigarette. Upon release from the hospital, one patient was capable of expanding his vocabulary and communicating spontaneously using logograms with family members. Several indices of the study suggested that all five subjects appreciated the communicative consequences of the system. Only partial instructional time was reported. For completion of Level I, the comprehension level, a mean of 5.4 weeks of 45 minute, daily (a 5-day week) sessions was required. Comprehension included commands, the interroga-

tive ("wh" words) form, and the declarative form.

Several studies have investigated the use of Premackian-like procedures with children exhibiting language difficulties. In a study of aphasic children with serious language deficits, Hughes (1974/75) employed the Premackian program and plastic magnet-backed logographic symbols of varied size and shape (color and texture were held constant). As with Premack's symbols, the plastic "words" were non-iconic to their referents. Two metal boards were used for word display; one for the examiner, one for the subject. Hughes hypothesized that if her subjects could acquire Premack's "language functions" while not having acquired language itself, after several years of training and exposure, it would suggest "that human language and Premackese differ in some important way" (p. 43).

Five of Premack's language functions were selected for the Hughes experiment: word, sentence, class concept, negation and question. The four subjects were two girls ages 9 1/2 years and 12 years, and two boys ages 8 1/2 years and 13 years. All had nonverbal intelligence quotients within the normal range and were enrolled in the same school. Training was done in 20 to 30 minute sessions twice weekly. Total number of sessions was not reported. Communication between experimenter and subject was by gesture only. No speech was used.

All four subjects easily learned the symbol concepts, and all four learned "word," "sentence," and "class" concepts with

the exception of the 12-year-old girl who did not reach criterion on one sentence type involving the preposition "on." Only two subjects reached criterion on negation; the 9 1/2-year-old girl and the 13-year-old boy. Three subjects failed to reach criterion on one of the question types. Viewing the effectiveness of the symbols and the techniques with her aphasic subjects, Hughes concluded that because the four subjects could not learn natural language but did learn several of the Premackian structures the latter would be better viewed as a communication system rather than language.

Carrier (1974b) who adapted Premack's technique and symbols for use with retarded individuals, trained 60 severely and profoundly retarded institutionalized children to recognize 10 concrete nouns in logographic form. Subjects, none of whom was observed using speech for communication, were required to pick up a geometric form (the symbol) and place it on a tray when a picture stimulus representing the symbol was presented. For example, when a line drawing of "boy" was presented, the subject was required to place a cut-out Masonite square (the symbol for "boy") on the tray. (The experimenter used manual guidance when necessary.) In the next step the subject was given an additional symbol and was presented randomly, for each trial, one of two line drawings. At each step in the training, a symbol was added until the total of ten symbols had been presented. A continuous reinforcement schedule of foodstuffs was used.

Posttesting followed completion of the program. Here the subject used the same symbols but had to respond to magazine pictures of the 10 words rather than line drawings. No verbalization was used during the experiment. A mean time of two hours, five minutes was required for completion of training.

In a second study, Carrier (1974a) thoroughly described his adaptation of Premack's technique and reported the successful acquisition of facets of the nonoral training program with a number of institutionalized retarded children who did not use speech for communication. The logograms utilized in the training were geometric forms cut from three-inch squares of Masonite. Each logogram was marked on the face with colored tape to signify its grammatical class, that is, "noun, verb, article, plural marker, and so on" (Carrier, 1974a, p. 55) plus its representation in T.O. Symbols which were placed in the object or last two positions in the sentence had a double row of colored tape to distinguish them from the subject position. Symbols were placed horizontally on a tilted response tray which was divided by vertically drawn lines into eight three-inch sections.

Four aspects of the training series were discussed by Carrier: 1) the Labeling Program, 2) the Rote Sequencing Program, 3) the Subject Selection Program, and 4) the Verb Selection Program. A continuous reinforcement schedule was used by the examiner. It is not clear whether the subjects, whose data Carrier summarized for each of the four programs, were the same

across all programs or were different subjects in each program.

In the Labeling Program, 10 nouns were taught. Subjects were required to place the appropriate noun logogram on the tray when a stimulus picture representing that symbol was presented. A symbol was added for each step until a total of ten nouns had been learned. A mean training time of 125.38 minutes was required for the 60 subjects to finish the program. This is approximately the same amount of time and the same program as reported previously by Carrier (1974b).

The Rote Sequencing Program was designed to train the subject to arrange eight symbols by color and number cues (two rows of colored tape versus one row) on the response tray in a left to right sequence. This task which was a simulation of syntax, required a mean time of 199.35 minutes for 60 subjects to complete.

The Subject Selection Program combined the two previous steps by training the subject to select and sequence in the same set of operations. The subject was shown a stimulus picture such as "The dog is sitting on the floor," and was then required to place (by color cue and number) the article in the first slot on the tray, then to choose the appropriate subject noun to match the picture stimulus and place it in the second slot. (Alternative nouns were added on each trial until five nouns were present.) Finally, the symbols for the rest of the sentence were presented and were placed in the correct slots

on the tray according to color and number cues. As the task progressed more symbols were presented simultaneously until in the final step all symbols for the entire sentence were presented simultaneously. Fifty subjects completed this program with a mean training time of 75.83 minutes.

The Verb Selection Program was similar to the Subject Selection Program except that this was not isolated from other behaviors as was the noun selection task. Rather, the five verbs were taught in the context of other required behaviors. Thirty subjects required a mean completion time of 363.42 minutes.

In the entire procedure nineteen logograms were learned for use in the eight-word sentences. If mean times had been added, the total task would have required approximately 13 hours to complete.

McLean and McLean (1974) described the acquisition of six three-element sentences by two nonverbal autistic children, age eight years. Carrier's (1974a) adaptation of the Premackian technique and symbols was employed in teaching the six sentences:

Linda give ball.	Jim give ball.
Linda give glass.	Jim give glass.
Linda give car.	Jim give car.

Abstract symbol shapes were cut from plywood and arranged horizontally on a slanted wooden tray.

Objects and physical action were utilized to match the symbols to meaning for the subjects. Training sessions lasted approximately 30 minutes per day. Transfer tasks consisted of:

1) training a second verb, the word "insert," substituting it for "give," and using a transparent plastic box to insert "ball," "glass," and "car," 2) performance of the six sentences in the presence of a new trainer, and 3) performance of the six sentences one week later in a different laboratory setting. Both subjects mastered the learning and transfer tasks, however, a large number of trials was required for this mastery. Subject A required 740 trials, while subject C required 1,345 trials. The authors remarked of the experiment that subjects had been trained to use symbols in a manner closely analogous to standard expressive performance. It would seem, to the present author, however, that spontaneous use of the sentences apart from the training situation would be necessary to validate this analogy.

Additional studies using a Premackian-type program with children exhibiting language deficiencies have incorporated T.O. into their training programs. For example, de Villiers and Naughton (1974) used T.O. in a slight departure from Premack's procedure. Subjects were two language deficient autistic boys, ages six and nine. De Villiers and Naughton employed spelled words printed on gummed labels affixed to moveable, rectangular 3x5 centimeter magnetized "particles" or shapes. Food was used as reinforcement. Different sentence types were constructed by the subjects using these "particles" on a magnetized board. The older child who was echolalic, utilized a vocabulary of 19 words, while the younger child used a vocabulary of 13 words.

Upon the child's completion of a nonoral sentence the experimenter read the sentence aloud to maximize its association with normal speech. The nine-year old gradually progressed from echoing the experimenter to reading the sentences aloud unprompted. Children were seen for only two 15-minute sessions per week; the older child for a total of 12 hours and the younger child, who did not progress as far, for a total of nine hours.

At the conclusion of the experiment, both subjects could communicate in part using the "particle" language. The older child had acquired the basic communication functions of naming, commanding, describing and questioning. Furthermore, his speech improved since he could also say the sentences appropriately.

It is interesting to note that these subjects could use moveable shapes with T.O. printed on the face as the discriminatory element in the same way as other subjects have used moveable symbols with shape, color, and texture as the discriminators. This might suggest that the Premackian shapes are not much easier to learn than T.O. in similar situations. However, there are no data presently available to support this suggestion.

In another study partially employing T.O., Maison (1972) used an adaptation of Premack's (1971) technique with five preschool hearing impaired children. Subjects, ranging in age from 3.1 years to 5.7 years, had severe and profound hearing losses, and extremely limited oral communication skills.

They possessed no written communication abilities.

Subjects were taught individually in 20 minute sessions, three times a week for up to five months. All sessions were completely nonoral, that is, speechreading was not used. The three younger subjects were taught with plastic logograms (like Premack's) of different shapes, colors and textures for twenty lessons, then were switched to small cards with words in T.O. printed on them. The two older subjects were taught exclusively with the spelled word cards. Younger subjects required only two lessons to transfer their eight to 14 word vocabularies from plastic shapes to word cards and had no difficulty acquiring additional vocabulary with the word cards.

All subjects learned to match single words to person, objects, colors and actions. Four of the subjects could read and compare four word sentences. Three subjects could read and compose seven word sentences and answer questions; and one subject could compose questions. Word order accuracy on sentence composition was 60 per cent or better.

In the studies just described that used a noniconic Premackian-type symbol system or T.O., the goal was to have the subjects learn specific patterns of communication or language. The attempt to map meaning onto moveable abstract shapes or to learn words in T.O. was generally a very time consuming task. Where indications of training time were given, even relatively "simple" tasks (e.g., comprehension, labeling) re-

quired several hours of instruction. Such results lead one to theorize that the use of iconic or even partially iconic systems might significantly reduce the learning time required for the total task. A number of studies have looked at the effectiveness of logographies that may be considered to be more iconic than the Premackian symbol system and the Carrier-Peak system derived from it.

One study that investigated the effectiveness of a partially iconic logography was conducted by Harris-Vanderheiden, Brown, MacKenzie, Reinen, and Scheibel (1975). These investigators reported on the implementation of samples of Bliss symbols as an alternate communication system for five mentally retarded, cerebral palsied children with severely delayed oral language skills. Some of these children had been unsuccessful at learning and using words in T.O. Programs were tailored individually for each child, who was seen once a week for eight to ten weeks for a total of approximately 15 to 20 hours. Teachers and ward personnel implemented and intensified the training between experimenter's weekly sessions. Two of the subjects, a 12-year-old and an 11-year-old, (who, following instruction, were believed to be educationally retarded rather than mentally retarded) learned 50 to 75 symbols respectively and used them for productive communication. The other subjects, an 11-year-old, a 14-year-old, and a 16-year-old learned 15, 16, and 6 symbols respectively and used them for sponta-

neous communication on some occasions.

As evidence that very young children can learn, and use to their advantage, a partially iconic vocabulary of logograms, Wolf and McAlonie (1977) reported on a study of language acquisition in eight severely retarded children ranging in age from 26 to 45 months. Subjects, who attended day activity centers, were judged to have a delay in language comprehension and to display no productive language. The first 20 lessons of the Minnesota Early Language Development Sequence (Clark, Moores, & Woodcock, 1975) were employed in 15 minute sessions, three times a week for 20 weeks. Subjects utilized a rebus and American Sign Language vocabulary of approximately 85 words (Wolf, 1977) in a variety of sentence patterns. Wolf and McAlonie reported that at the conclusion of the study, all subjects had made substantial gains in receptive language skills. Furthermore, four of the subjects had begun to verbalize substantially as well as to use sign language on certain occasions.

Another study on the acquisition of iconic logograms in young children was reported by Baxter (1972). Eight Down's Syndrome children ranging in age from 32 to 39 months learned a vocabulary of 17 rebuses from the Peabody Rebus Reading Program (Woodcock, Clark, & Davies, 1969). Subjects were seen in ten to fifteen minute sessions, two to four times a week for eight weeks. Results showed that iconic logograms can be learned and used in reading and language activities at a very

young age and by children whose mental ages are even younger than three years.

While the three studies just described (Harris-Vanderheiden, et al., 1975; Wolf & McAlonie, 1977; Baxter, 1972) suggest the potential effectiveness of a partially iconic symbol system, they do not address the question of the relative effectiveness of an iconic or partially iconic system as compared to a non-iconic system. One attempt to make such a comparison was reported by Kuntz (1974) who compared the effectiveness of rebus symbols to abstract Masonite shapes in an abbreviated version of Carrier's (1974a) nonoral procedure. She also included in the study a transition-to-T.O. task.

Subjects were 14 institutionalized retarded children with limited communication abilities, who ranged in age from nine years, 11 months to 18 years, 10 months. IQ scores ranged from 23 to 61.

Subjects were randomly assigned to two treatment groups. An Abstract Symbols group was trained using abstract geometric shapes cut from Masonite. These symbols were noniconic to their word referents. A Rebus Symbols group was trained using symbols adapted from the Peabody Rebus Reading Program (Woodcock, Clark, & Davies, 1969). These were primarily iconic symbols drawn on index cards that were covered with transparent plastic. Teachers reported that the subjects, on entry into the study, could read few, if any, words in T.O. Consequently, pretesting

on the T.O. transfer words was not conducted. Four-word sentences of the type "The boy is sitting," were used in the task.

A piece of colored tape was affixed to the face of each logogram to indicate its grammatical class. The color "red" indicated an article, "orange" a noun, "green" the auxiliary verb "is," and "blue" indicated a verb. The spelled word was written on the back of each logogram for the experimenter's benefit. Twelve words were utilized: five nouns, "cat," "boy," "dog," "girl," "bird"; five main verbs, "running," "eating," "laying" (used for the word "lying"), "standing," "sitting"; and "the," and "is." Unfortunately, an identical rebus symbol was used to represent both the words "boy" and "standing," thus introducing a degree of confusion into the task for the Rebus Symbols group. A tilted tray (similar to a chalkboard tray) divided by lines into eight sections was used as the receptacle onto which subjects placed the moveable logograms. Only four of the sections were needed since sentences were only four words in length. A continuous schedule of reinforcement was employed using edible and social reinforcers.

The training procedure was divided into three phases. In Phase I, subjects who had been prescreened for motor imitation and color discrimination, were trained to sequence four color-coded symbols in a left-to-right sentence pattern. There were no significant differences between the Abstract Symbols group, and the Rebus Symbols group in this task. In Phase II subjects

were trained to match the five nouns and five verbs to stimulus pictures. They then had to select and place the appropriate noun and verb in the correct slot on the tray when a stimulus picture was presented. The words "the" and "is" were always placed by the subject in the proper position according to color code only. Each group was trained with its respective symbols. Verbalization was used at times by the experimenter to label words of the lexicon and frequently was used in prompting children to attend or respond. No vocal response, however, was required from a subject. In Phase II significance was obtained in two out of three of the parts by the Rebus Symbols group, who required fewer responses to reach criteria on matching of symbols to pictures, and correct selection and placement of verbs in the four-word sentences.

Phase III incorporated a fade and a nonfade procedure in the transition of the five nouns and five verbs to T.O. Following the transition to T.O., subjects were trained to select the appropriate printed word card or Masonite shape and place it in the correct rote sequence when presented a picture stimulus.

For the Abstract Symbols subjects, the fade procedure was employed with the five verbs, while the five nouns in T.O. were trained with a nonfade procedure. The Rebus Symbols group, received the fade procedure on nouns in T.O. while the verbs in T.O. were trained with a nonfade procedure. Four levels of

fading were employed.

In the first level of the Rebus Symbols condition the rebus symbol was presented with the spelled word beneath it. In the next two levels the rebus symbol was less intense but still clearly visible above the spelled word. In the fourth level only the spelled word appeared on the card. In the Abstract Symbols condition, the Masonite logogram appeared with the spelled word printed on the face of the symbol. In the first level the original shape appeared. In the second level the shape of the Masonite symbol was changed somewhat, and was changed even more in the third level. In the fourth level the spelled word appeared on a rectangular Masonite logogram. Clearly the two fading conditions were not parallel. The rebus symbols were never faded beyond recognition, therefore, the subjects had no reason to attend to the spelled word until it appeared alone. In the Abstract Symbols condition most of the geometric shapes changed from level to level to different shapes; hence subjects, who were familiar with the original shape were faced at the second level with two unknowns, a different shape and the spelled word. Unlike the Rebus condition, subjects were as likely to attend to the spelled word at this level as to the shape. The Abstract Symbols group required significantly fewer responses than the Rebus Symbols group to obtain criterion in the one part of this three-part Phase which showed significant differences between

groups.

The entire program required approximately four months to complete with a mean training time of seven hours, 55 minutes. A subject in the Rebus Symbols group did not finish the program, hence a subject in the Abstract Symbols group was dropped. Therefore, data were reported for only 12 subjects.

Kuntz concluded, "The total number of responses to complete the entire training program was slightly less for Group A [Abstract Symbols] than for Group B [Rebus Symbols]. [This difference, however, was not significant.] This may be accounted for by the fact that Group A's subjects, having learned one level of abstraction, could generalize this information to learning printed words" (p. 118). It appears, however, that the study had several methodological problems that were detrimental to the Rebus Symbols group but not to the Abstract Symbols group.

In discussing the study, Kuntz noted that the Rebus subjects were penalized in task time due to their difficulty in picking up the thin plastic-covered cards. The Abstract Symbols group had no difficulty picking up the Masonite shapes which had a depth of 5 millimeters. Kuntz further added that the larger size of the rebus materials appeared to have a detrimental effect on response rate. The index cards required a much larger visual scan area than the Masonite shapes when placed in front of a subject, thus requiring a longer time

period to locate the proper symbols. Other problems, such as the use of one rebus symbol to represent two words, and the difference in fading procedures, detracted from the performance ability of Rebus subjects.

Kuntz found that there was not a significant difference favoring one response mode over another for the "communication program." The study did indicate, however, that rebus symbols were easier to learn than the abstract shapes. Kuntz remarked that Rebus Symbols subjects:

had a meaningful association of their environment to many of the natural signs [rebuses]. They were able to generalize this information to match the natural signs to the stimulus pictures. Training for these steps required few trial presentations since they essentially knew the information before training was initiated. (p. 118)

A study by Woodcock (1968a) attested to the fact that a sample of rebuses can be learned and used in sentence reading in a matter of a few minutes. Subjects in this study were 10 nonreading, culturally disadvantaged kindergarten children. Nineteen words and the "ing" inflection were utilized in the two treatments, which were identical in content and format except that one was presented in T.O. and the other in rebuses. Five levels of difficulty were employed. At each level four new rebuses or the equivalent forms in T.O. were presented orally. Phrases or sentences were then presented, requiring the subject to practice reading the new words in context. After each level a test passage was read by the child and oral

reading errors recorded. By the end of Level Five, subjects were reading sentences of 13 words in length. The entire procedure required about 20 minutes for each subject to complete. There was a significant difference ($p < .001$) between the two groups favoring the rebus group. The T.O. group read a mean number of 9.80 words correctly, while the rebus group read a mean number of 70.40 words correctly. As the vocabulary increased in number the memory load for the T.O. subjects became too great, whereas the rebus subjects quickly built and retained their rebus vocabularies. The point of this study is that an iconic or partially iconic set of logograms can be learned and utilized very quickly, whereas, the acquisition of an identical set of words in a noniconic system such as T.O. requires much longer.

While partially iconic systems seem to be easier to learn than the noniconic T.O., the introduction of T.O. as a follow-up to instruction in an "iconic" system may prove to be an effective strategy for facilitating the acquisition of T.O. Few researchers have examined this possibility. However, one large study that was partially addressed to this subject was the Peabody-Chicago-Detroit Reading Project (Woodcock, 1968b). The two year study compared six different approaches to beginning reading with nonreading educable mentally handicapped children in Chicago and Detroit. One of these approaches was a basal reader series written entirely in rebuses that were

put into a transition to T.O. before the end of the second year (Woodcock, 1977). Two of the approaches were i.t.a. (basal reader, and language experience), and the remaining three were T.O. (basal reader, language experience, and programmed text). Initially 607 subjects in 112 classes participated, but by the end of the two-year study only 321 subjects in 85 classes remained. Woodcock found a mean gain in reading T.O. of approximately five and one-half months in all six conditions after two years of instruction. No significant differences were found among approaches. Of interest, however, is the fact that subjects in the rebus condition spent only half as much time using an alphabetic system as the comparison groups (Woodcock, 1977), yet, at the end of the second year, were at the same reading level in T.O. as the subjects in the other five conditions. This would suggest that the rebus-trained group had a heightened learning rate for T.O. as compared to other groups. Hence there appeared to be a direct transfer from Rebus to reading T.O. Whether this rate would have continued later in school and accelerated their reading level beyond that of other subjects is unknown since the study ended after two years. It is possible, however, that early logographic training does facilitate the acquisition of T.O.; but perhaps this facilitation may be indirect, or such that it is not presently measured in reading tests.

In recent years, there has been concern (Francis, 1973;

Hall, 1976; Huttenlocker, 1964; Vernon, 1958) that children approaching the task of learning to read cannot segment their oral language flow into discrete word units, hence do not have an oral match for words in print. This is thought to be one of the causes of early reading difficulties. Cahill (1974), concerned about children's difficulties in segmenting the speech flow, conducted a study to determine if kindergarten students who had completed a formal readiness program utilizing rebuses interspersed with T.O. in reading, would have a better understanding of oral language than kindergarten students of comparable ability who had not been so trained. Subjects were 25 rebus-trained children and 25 children who had not been given rebus training. Basically, the rebus program consisted of: 1) teaching in T.O. 16 high frequency words such as, "is," "the," "not," "will," "its," "she," "I," and others; then, 2) teaching rebuses for content words such as, "ball," "wagon," et cetera. Children began reading phrases, sentences, and little stories using the rebus vocabulary along with the words in T.O. They were thus exposed to language in print using a few spelled words and several iconic logograms.

To determine differences between rebus-trained and non-rebus-trained subjects, Cahill presented 15 sentences orally to subjects and asked them to: 1) report the number of words in each sentence, and 2) report the individual words in each sentence. Students who had completed the rebus training pro-

gram scored significantly higher (at the .001 level) at segmenting oral language than the group who had received no training.

Summary. While the body of literature on the use of logograms in instruction is relatively small, the results have been quite consistent. In most of the descriptive studies employing logograms, the investigators did not question the effectiveness of the particular logography employed. This was true whether the subjects were aphasic, autistic, cerebral palsied, hearing impaired, mentally retarded, or nonhandicapped. Despite the apparent endorsement of the logographic approach to teaching language and/or communication expressed by these investigators, it should be noted that most of the procedures using noniconic logographies required long periods of time for the subjects to learn the symbols. Also, the one study that employed similar techniques using T.O. without the typical logogram discriminators (de Villiers & Naughton, 1974), suggested (although without supporting data) that the Premackian-type symbols, at least, were not easier to learn than T.O.

The only studies that made comparisons between symbol systems were those of Kuntz (1974) and Woodcock (1968a). Kuntz' research compared Rebus symbols to Carrier-Peak symbols. Her finding of no difference between the partially iconic and the noniconic systems is questionable, however, since there were numerous methodological problems that seemed to discriminate

T.O., or whether there are any differences in learning words represented in Carrier-Peak, Bliss, and Rebus. This information on the ease of learning various types of symbols should be highly valuable to researchers, and have implications for the selection of a particular system for those interested in developing instructional programs using logograms.

The purpose of the present study was to provide comparative data on the four graphic systems. The research questions asked were:

1. Will the mean number of words learned by subjects be greater in the logographic systems (Carrier-Peak, Bliss and Rebus) than in T.O.?
2. Will the mean number of words learned by subjects be greater in the partially iconic logographies Bliss and Rebus than in the noniconic Carrier-Peak logography?
3. Will the mean number of words learned by subjects be greater in the Rebus system than in the more stylized Bliss system?

Chapter 2

METHOD

Subjects

Thirty-six boys and girls between the chronological ages (CA) of 4-4 (four years, four months) and 5-5 with mental ages (MA) between 4-4 and 5-7 as measured by the Peabody Picture Vocabulary Test (PPVT), Form A (Dunn, 1965), were randomly selected from a pool of children in four day care centers in a large metropolitan area of the upper midwest. Children enrolled in these centers were of multiethnic backgrounds and varied socioeconomic levels. All subjects spoke English as a first language and were nonreaders with no apparent handicapping conditions. Subjects were randomly assigned to one of four experimental conditions. Each experimental condition contained a total of nine children. Means and standard deviations of CAs and MAs for each of the four treatment groups are presented in Table 1.

Although subjects were randomly assigned to treatments, the Carrier-Peak subjects had a somewhat higher mean mental age than subjects in other groups (see Table 1). Hence, an analysis of variance was performed on MA means to determine if there were significant differences. Table 2 presents the results of this analysis. As may be seen in this table, there were no significant differences in mental age.

Table 1
Means and Standard Deviations of
CAs and MAs by Treatment Groups

Treatment Groups	CA in Months		MA in Months	
	M	SD	M	SD
Bliss	59.44	4.22	57.78	4.21
Carrier-Peak	60.11	3.14	63.11	4.28
Rebus	56.78	3.49	58.11	5.01
T.O.	58.56	4.42	59.56	4.48

Table 2
Analysis of Variance of
Mental Age of Treatment Groups

Source	SS	df	MS	F	p
Between	160.75	3	53.58	2.64	N.S.
Within	649.56	32	20.30		
Total	810.31	35			

Materials

Vocabulary

In order to compare the learning of words represented commonly among the four systems, it was necessary to select from the vocabulary used in the Carrier and Peak (1975) Non-SLIP program since it employs only 34 items. Most of the words used in Non-SLIP can be matched to stimulus pictures that are simple line drawings, therefore, items such as "standing," "sitting," "truck," and others have meaningful referents of a concrete nature. Twenty-six of these words, which are nouns, main verbs, and prepositions, are common to all three systems. From this common pool, the following sample of 15 words was drawn randomly: "baby," "bed," "bird," "car," "chair," "floor," "grass," "lady," "man," "on," "play," "sit," "stand," "tree," and "under." These words were considered to be functional in the oral vocabularies of the subjects. Non-SLIP uses one symbol to represent two morphemes in verbs such as "playing," "sitting," and "standing." The "ing" morpheme was dropped from these words in the present study.

Symbols

The Carrier-Peak moveable abstract plastic shapes were traced and reduced in size for this research. There are no reports in the literature of the abstract shapes having been discriminated tactilely by humans; rather, the discrimination

was described as being done visually before the symbols were picked up. For this reason, the graphic conversion of these shapes was felt to represent fairly their visual discriminatory attributes for comparison with other graphic systems.

All logographic words were approximately 3/4 inch square. These were line drawings in black ink which were cut out and adhered to the treatment pages. Words in T.O. were typed on the pages using primary size type, making most spelled words comparable in width to the logographic words.

Most of the 15 selected words were excellent examples for comparing Bliss symbols to Rebus symbols. The sample of words contains logograms used mostly in the primary class (Gelb, 1963) by both the Rebus and Bliss system. This situation provides for a comparison of a sample of what should be the class of easiest-to-learn logograms in the two systems.

Treatment Pages

Materials consisted of 16 pages of words in each treatment condition. Eight pages were stimulus pages, eight were response pages. The final response page was the criterion measure.

The task was divided into eight levels. At each level a stimulus page was presented, then a response page. The number of words on the stimulus and response pages at each level of the task is presented in Table 3. As may be seen in this table, the number of words on response pages increased by two from

Table 3
Number of Words on Stimulus Pages and
Response Pages at Each Level of the Task

Levels	Number of Words	
	Stimulus Pages	Response Pages
1	1	1
2	2	3
3	2	5
4	2	7
5	2	9
6	2	11
7	2	13
8	2	15

level to level.

Words were arranged randomly on response pages according to a random numbers table (Winer, 1971). The exceptions to this randomization were the first two positions on the page. These two words were in the exact order that they appeared on the stimulus page which had just been presented.

Each page of heavy, opaque white paper measured 6 1/2 inches by 8 1/2 inches. Heavy black lines formed boxes for separating each word on the response pages. The four sets of treatment pages were bound into an eight-ring, loose-leaf, easel-kit binder. This binder sat upright on a table and provided a flip-chart arrangement for allowing simultaneous presentation of the pages of words to the subject on one side, and on the other side, providing the examiner with instructions and a typed copy of the word arrangement. Tabbed, plastic pages separated the treatment conditions. Appendix A contains the treatment pages and a copy of the response form.

Procedure

Two trained examiners administered to potential subjects of the study the PPVT, and a word recognition test consisting of the 15 words to be used in the study. These test words were represented in T.O. only since none of the prospective subjects had been exposed to the logographic systems but had possibly been exposed to T.O. From the pool of children who could read

none of the 15 words, and who were in the desired mental age range (4-4 to 5-7), 36 subjects were randomly selected and assigned to the treatment groups by means of a random numbers table.

One examiner administered the treatments to all subjects. Children were taken individually from their classrooms into a small, quiet room. They were seated in a chair at a child-sized table on which was placed the easel binder opened to a blank page. The child was seated on the examiner's left so that recording of responses would not distract the subject. After establishing rapport, the examiner said to the subject:

"I am going to show you something and tell you what it is, then I want you to tell me what it is."

The examiner then turned to page one, the first stimulus page, pointed to the solitary word and said:

"This is 'play.' Say that for me."

After the subject repeated the word, the examiner turned to page two, the first response page, pointed to the word "play" and asked:

"What is this?"

Three seconds were allowed for a response. If none was forthcoming, the subject was told the word. These responses were recorded to prevent the examiner's omission of a page. The data were not used in the primary analysis.

The second stimulus page, page three, was then presented to the subject, who was told, in the same wording as above, the

first word on the page and then asked to repeat it. After repeating the word, the subject was told immediately the second word and was asked to repeat it. The examiner turned to page four, the second response page, pointed to each word and asked what it was. (The examiner always pointed from left to right and continued down the page, row by row.) The subject's responses were recorded and the task continued in the same manner until the last page which was the criterion measure. On this page subjects were asked to name each of the 15 words. When the task, which required about 15 minutes, was finished, the examiner thanked the subject who was then returned to the classroom.

Design

The research questions asked in this study involved specific comparisons between types of graphic systems. Previous research has shown that there are significant differences between some systems, hence the use of an omnibus F test would furnish redundant information. This study was interested only in comparisons between means which had experimental relevance, thus, planned orthogonal comparisons were employed to answer the research questions.

Contrasts were made between:

- 1) the three logographic systems (Carrier-Peak, Bliss and Rebus) and T.O.,

- 2) two partially iconic logographies (Bliss and Rebus) and a noniconic logography (Carrier-Peak)
- 3) a logography with mostly realistically drawn symbols (Rebus) and one whose symbols are highly stylized (Bliss).

Chapter 3

RESULTS

This study was designed to examine the comparative ease of children's learning of words represented in four different graphic systems (Carrier-Peak, Bliss, Rebus and traditional orthography). The dependent variable was the number of correct responses on the 15-item criterion measure. The independent variable was treatment.

Means and standard deviations of the criterion measure are presented in Table 4. As may be seen in this table, the Rebus group had the smallest standard deviation, while the T.O. group had the largest.

A priori orthogonal comparisons were utilized according to Keppel (1973, p. 98) in analyzing the data of the four experimental conditions. The sets of hypotheses implicit in the research questions and the associated orthogonal coefficients for each of the three comparisons are presented in Table 5. It was decided to reject a null hypothesis if a probability value equal to or less than .05 was obtained on a particular comparison.

The F values of the comparisons are presented in Table 6. In all three contrasts, significant differences were found. In Comparison I, the contrast of logographic systems (Carrier-

Table 4
Means and Standard Deviations of
Correct Responses on the Criterion Measure

Treatment Groups	M	SD
Rebus	14.44	.88
Bliss	12.22	1.30
Carrier-Peak	7.22	2.16
T.O.	3.44	3.68

Table 5
Statistical Hypotheses and Associated Orthogonal Coefficients

Comparison	Hypothesis	Coefficients			
		C_1 Rebus	C_2 Bliss	C_3 C-P*	C_4 T.O.
I	$H_0: (\mu_1 + \mu_2 + \mu_3)/3 = \mu_4$	1	1	1	-3
	$H_1: (\mu_1 + \mu_2 + \mu_3)/3 \neq \mu_4$				
II	$H_0: (\mu_1 + \mu_2)/2 = \mu_3$	1	1	-2	0
	$H_1: (\mu_1 + \mu_2)/2 \neq \mu_3$				
III	$H_0: \mu_1 = \mu_2$	1	-1	0	0
	$H_1: \mu_1 \neq \mu_2$				

*Carrier-Peak

Table 6
Analysis of Variance of the Three Treatment Comparisons

Source	SS	df	MS	F	p
Treatment	(662.44)	(3)	416.30		
Comparison I	416.30	1	223.98	80.52	<.001
Comparison II	223.98	1	22.16	43.32	<.001
Comparison III	22.16	1	5.17	4.29	<.05
Within	165.56	32			
Total	828.00	35			

Peak, Bliss, and Rebus) against T.O., a large F value indicated a significant difference ($p < .001$) favoring the logographic systems.

In Comparison II, the partially iconic logographies Bliss and Rebus were contrasted with the noniconic logography, Carrier-Peak. A significant difference with probability less than .001 was found favoring the partly iconic logographies.

Rebus was compared to Bliss in Comparison III. Here a significant difference ($p < .05$) was found between the two logographies, with the differences favoring Rebus. Raw scores for the Criterion Measure and matching CAs and MAs for each subject are presented in Table 7.

The ranges of scores in the Carrier-Peak and Bliss conditions were greater than in the Rebus condition, although the range of scores of the Bliss subjects was relatively small. These scores varied only between 10 and 14. Scores for subjects in the Carrier-Peak condition ranged between 3 and 10, whereas a wider range of scores was displayed in the T.O. group, with scores varying between 0 and 10.

As may be seen in Figure 5, the mean of the Rebus group was greater than the highest score obtained by the Bliss group. This same condition occurred with the Bliss mean and the highest score of the Carrier-Peak group. Furthermore, the lowest Bliss score was the same as the highest Carrier-Peak score and the highest T.O. score.

Table 7

Raw Scores of the Criterion Measure with Matching CAs and MAs

Subject Number	Criterion Raw Score	CA	MA
<u>Rebus</u>			
1	15	63	62
2	15	55	56
3	15	59	65
4	15	56	56
5	15	54	51
6	15	58	59
7	13	54	53
8	14	52	56
9	13	60	65
<u>Bliss</u>			
10	14	62	61
11	10	54	56
12	12	52	53
13	13	58	56
14	11	64	55
15	12	58	59
16	14	62	65
17	12	62	53
18	12	63	62
<u>Carrier-Peak</u>			
19	8	54	56
20	6	62	65
21	6	62	65
22	6	60	67
23	10	59	67
24	9	62	56
25	3	59	65
26	8	58	62
27	9	65	65
<u>T.O.</u>			
28	2	54	53
29	2	57	53
30	0	54	61
31	1	64	65
32	10	63	62
33	4	58	61
34	0	54	58
35	9	65	65
36	3	58	58

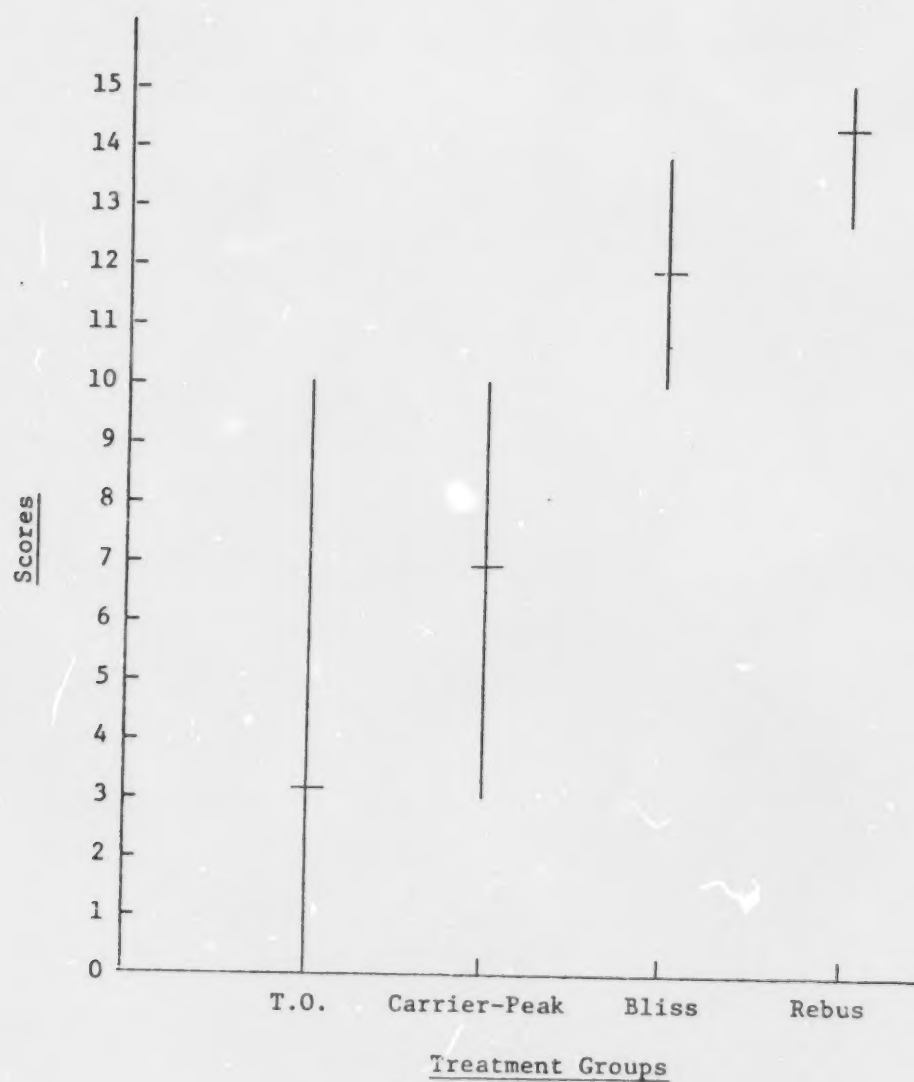


Figure 5. Mean and range of scores for the four treatment groups.

The number of subjects who scored at each point along the range of scores in the four treatments is presented in Figure 6. A ceiling effect is present in the Rebus condition, with two-thirds of the subjects obtaining perfect scores. Over two-thirds of the T.O. subjects, however, obtained scores of fewer than four words correct.

The comparative results reported above were based upon the performances of subjects at the final stage of training. During training, however, subjects were actually required to make eight levels of responses.

Figure 7 presents the mean scores obtained by the Rebus, Bliss, Carrier-Peak, and T.O. groups at each of the eight response levels. The solid line represents the maximum score that could be obtained at each level. Examination of the relative performances of the four experimental groups reveals distinct differences in the progress made by each group. Across all response levels, the Rebus group consistently performed at a level close to perfect. Subjects in the Bliss group also performed nearly perfectly on the first three response levels. In fact, the mean scores of the Bliss group at these levels were the same as the mean scores for the Rebus group. After the first three response levels, however, the Bliss means gradually fell below the Rebus means, with the difference between the two groups becoming most evident at the last two response levels. At Level 7, Bliss subjects scored approximately 1.2

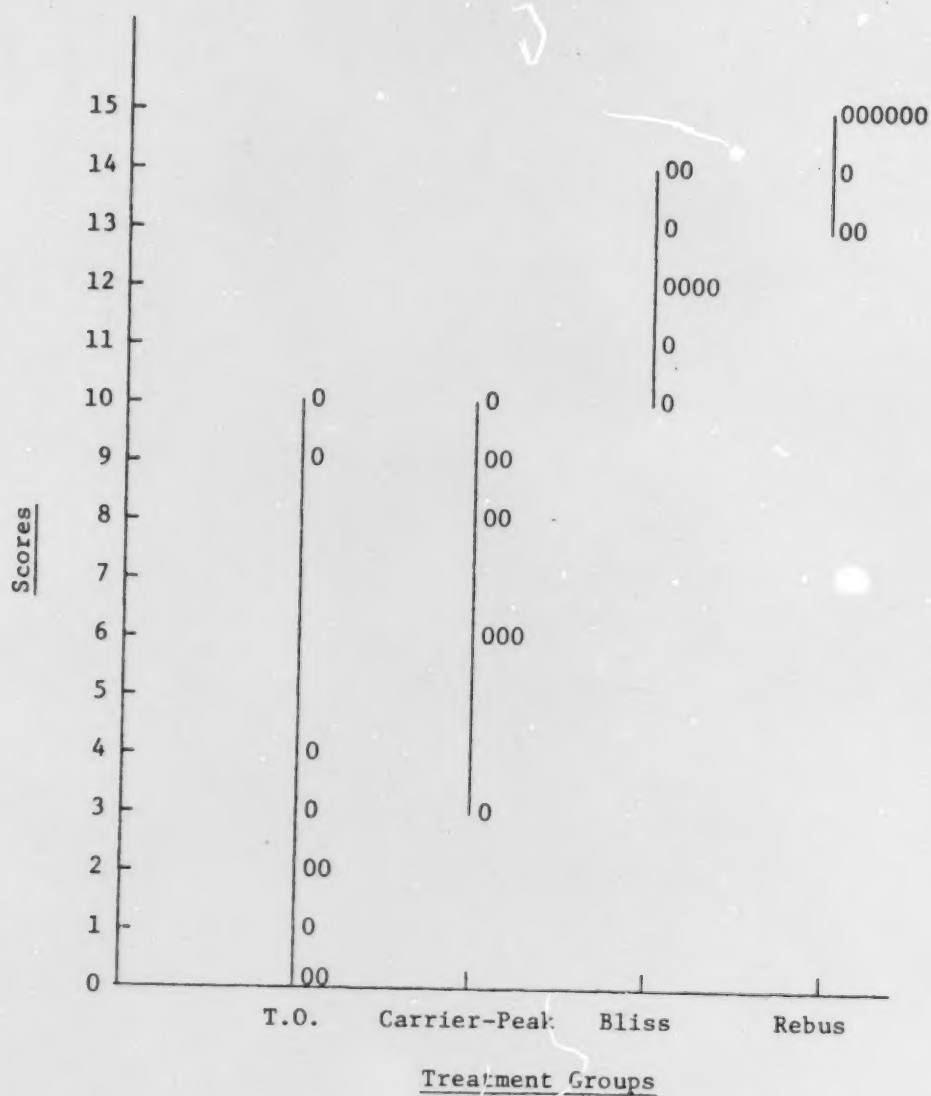


Figure 6. Number of subjects scoring at each point along the range of scores for each treatment.

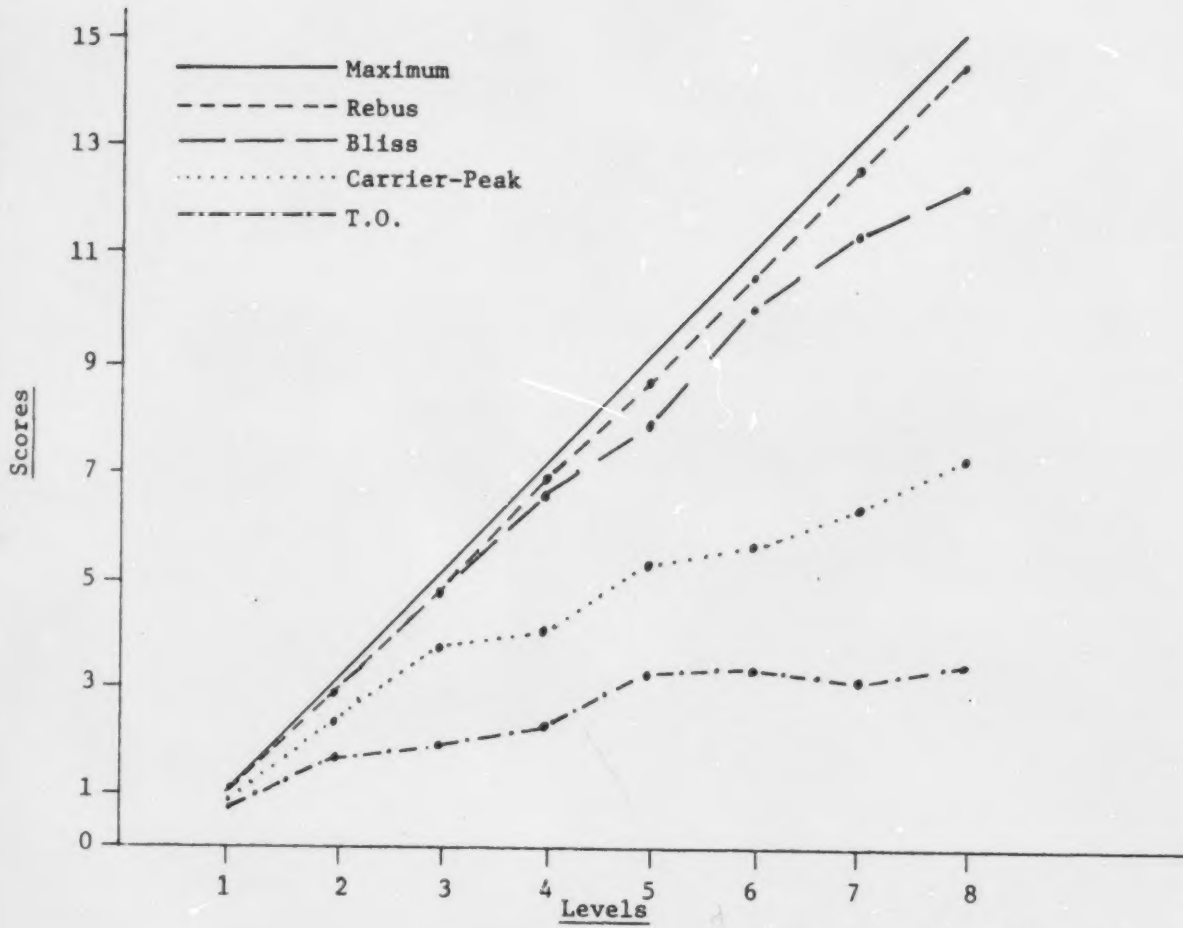


Figure 7. Mean scores of groups across response levels.

87

words less than the Rebus group, and at Level 8 (as reported previously), the difference between the Rebus and Bliss groups was 2.2 words.

In comparison to the Rebus and Bliss groups, the progress made by subjects in the Carrier-Peak and T.O. groups was relatively slow. For both groups, the gap between a perfect score and the obtained score widened as words were added at each level. By Level 4, the Carrier-Peak subjects had a mean score of approximately 57% correct, and by Level 8, the mean score (7.22 correct) was only slightly above 50% correct. The extent of the difference between obtained and perfect scores was greatest for T.O. subjects, who by Level 4 were performing at approximately 33% correct, and by Level 8 were performing at 23% correct.

Chapter 4

DISCUSSION

The purpose of the a priori comparisons made in this study was to determine if there were significant differences among preschool children in the learning of words from various types of graphic systems. Three comparisons were made in order to answer the following research questions:

Will the mean number of words learned by subjects be greater in the logographic systems of Bliss, Carrier-Peak, and Rebus than the alphabetic system of T.O.?

Will the mean number of words learned by subjects be greater in the partially iconic logographies of Bliss and Rebus than in the noniconic Carrier-Peak logography?

Will the mean number of words learned by subjects be greater in the Rebus system than in the Bliss system that consists of more stylized symbols than Rebus?

Results of each of the comparisons will be discussed separately.

Comparison I

The results of the first comparison clearly showed that small samples of logographic words are significantly easier ($p < .001$) for preschool nonreaders to learn than are those same words in T.O. Thus, the first research question was answered positively, and the null hypothesis (see Table 5) implicit in the question was rejected. This finding concurs

with that of Woodcock (1968a) who reported that rebus symbols were significantly easier for preschool children to learn and use than T.O. Moreover, the study by Wolf and McAlonie (1977) attested to the fact that logographic words when concatenated into meaningful phrases and sentences could be read and comprehended even by very young children.

In addition to the fact that logographies are easier for young children to learn than T.O., it should be noted that these symbol systems appear to be useful for individuals such as certain aphasics who may have difficulty handling T.O. and/or oral language (Gardner, et al., 1976; Hughes, 1974/75; Velletri-Glass, Gazzaniga, and Premack, 1973). One explanation for this was offered by Geschwind (1971), who, citing evidence from neurological studies, suggested that:

the processes of handling the complex visual patterns of ideographs [logograms] and of blending smaller phonetic elements [such as is required with T.O.] are handled differently by the nervous system. (p. 190)

Geschwin (1972) further suggested that logograms that "simultaneously represent both a sound and a meaning" (p. 83), are handled primarily by an area of the brain (Wernicke's area) that deals with meaning related functions, whereas, much of the reading and spelling of T.O. may be handled in the area of the brain that deals with sound-producing functions (Broca's area). This information from Geschwind implies that logograms, unlike T.O., map directly onto meaning.

In light of the above information, it is reasonable to theorize that logographies' mapping directly onto meaning may account in part for some severely handicapped individuals being able to communicate using logograms when they have not been able previously to communicate satisfactorily with speech or with T.O. (Carrier, 1974a; Harris-Vanderheiden, et al., 1975). It may also account for the fact that certain children quickly learn to read with logograms when they have failed with T.O. Rozin, Poritsky, and Sotsky (1971) reported on such a situation with eight second-grade inner-city students who had not been successful at learning to read. Students were taught 30 abstract Chinese characters, and, after three to six hours of tutoring, read connected discourse with fair to good comprehension.

Several studies (Baxter, 1972; Cahill, 1974; Wolf & McAlonie, 1977) have shown that preschool children can easily learn and use logograms in situations that enhance their knowledge of language. Of particular interest is the use of logograms in teaching children to match their oral language flow to the individual units of language in print. It is this type of knowledge, transferring directly from the reading of logographic passages to T.O., that may be of utmost importance to the beginning reader of T.O. Gibson and Levin (1975) remarked:

there is...something to be said for the logograph
[logogram] at an early stage of learning: It has

direct semantic correspondence, and it is the meaning in language that children are aware of when they begin to read. (p. 523)

Comparison II

If logograms do map directly onto meaning as suggested previously, then one might reason that the more meaningful the symbol the easier it would be to learn. Such was the implication of the second comparison in this study. The partially iconic logographies, Bliss and Rebus, were significantly easier ($p < .001$) to learn than the noniconic Carrier-Peak system. The significant finding of Comparison II thus leads to rejection of the null hypothesis implicit in the second research question.

Nearly all of the Bliss and Rebus symbols employed in the study were primary class (Gelb, 1963) symbols, whereas, the Carrier-Peak symbols were all of the diagrammatic class. Thus, the outcome of Comparison II might have been predicted since the primary class contains symbols that are somewhat meaningful, and the diagrammatic class contains only abstract symbols.

Although the Carrier-Peak symbols were represented in graphic form in the present study and were more difficult to learn than Bliss or Rebus, in their original moveable form they were also more difficult to learn than rebuses (Kuntz, 1974). The shapes from which the Carrier-Peak symbols were adapted, were developed by Premack (1971) for use with a chimpanzee.

The plastic forms may have been ideal for the ape. They required only gross motor movement; and, because they had to be picked up and arranged on a board, they served to control attention in the subject. The same or similar abstract shapes were employed with humans in many of the studies reported earlier. The needs of these experimenters, however, for using the abstract shapes may not have been as crucial as Premack's was for apes. Indeed, several of the experimenters deviated somewhat from the noniconic forms.

In regard to the importance of one type of symbol system versus another, Hollis, Carrier, and Spradlin (1976) stated:

in developing writing and reading it is the nature of the program that is crucial, not the configuration of the stimulus element--abstract geometric figure or printed word. (p. 287)

It is agreed that the nature of the program is crucial, however the ease with which the "stimulus element" is acquired by the subject determines, in part, how quickly and effectively the subject matter of the program is mastered. For example, if the "stimulus element" is the printed word then the program for some children may be impossible to master. Thus, the symbol system itself does have some impact on the nature of the program.

The data in Comparison II show that iconic or partially iconic systems are much easier to learn than noniconic systems. The use of the abstract Premackian-type symbols with humans

appears to be a time-consuming process that may not be crucial or necessary to a particular program itself. The abstract moveable shapes have not been reported as being discriminated tactilely. Thus, if a moveable symbol is desired, a more iconic one might prove more efficacious.

Comparison III

The third research question asked if Rebus symbols would be easier to learn than the more stylized Bliss symbols. Comparison III showed a significant difference ($p < .05$) in means favoring the Rebus system. Thus the implicit null hypothesis of no difference was rejected.

The Bliss system as a whole appears to be more complex than the Rebus system. This complexity stems in part from Bliss' heavy use of semantic indicators (Gelb, 1965) in compounds and from having to learn how to form the compounds. The present study did not touch on the learning of compounds, however, but rather on the simplest aspects of the Bliss system. (Some combinations and semantic indicators were present in the Bliss symbols condition as may be seen in Appendix A.) Thus, even in their simplest form, the highly stylized Bliss symbols are more difficult for preschool nonreaders to learn than the Rebus symbols. One distinct difference in the primary class symbols of Bliss and Rebus is that one can guess the meaning of many unfamiliar rebuses, whereas, this is not possible with the Bliss symbols.

Limitations

Certain limitations are imposed on the interpretation of the results of this study. One of these limitations is the small age range of subjects (4-4 to 5-5). Generalizations, therefore, cannot be made to younger children. This particular age range, however, is a rather important one, in that, children are becoming attuned to and interested in language in print.

A second limitation is the small number of words (15) employed in the learning task. Obviously, the task was too easy for the Rebus group since six subjects obtained perfect scores. Hence, a ceiling effect was present in the data.

Furthermore, the task was quite short, averaging only 15 minutes. Had training lasted longer, say for example, 15 minutes a day for three days, and the vocabulary been extended or tripled, there might have been even greater differences. One might predict that the T.O. subjects, several of whom were frustrated in the present task of 15 words, would possibly refuse to continue as more and more vocabulary words were added to the task.

Third, the graphic representation of the Carrier-Peak symbols may have some limitations on the interpretation of the data. To date, however, there is no indication from the literature that these symbols are processed any other way than visually.

Implications of the Study

One finding of this study suggests that partially iconic symbol systems may be a great deal more efficient for immature learners than noniconic systems. This has direct implications for the use of logographic systems in language training or remediation programming.

Another implication is that the Rebus system may be the "best" system to use with very young children. Rebus symbols are more iconic, thus more meaningful immediately than symbols in the other three systems (Carrier-Peak, Bliss, T.O.). Consequently, they are easier to learn. Although generalizations cannot be made from this study to handicapped populations, it is possible that in a similar learning situation, rebuses might also be easier to acquire for certain handicapped persons such as hearing impaired or retarded individuals.

The third implication of this study relates to beginning reading. A simple-to-learn logographic system may be an ideal introduction to reading for all children and could be initiated long before the age of kindergarten entrance. With such a system, a gross form of decoding is involved, that is, decoding of printed language into word units. A simple logographic system, then, should serve as an aid to children in segmenting oral language into the word units that are necessary for reading language in print.

Suggestions for Future Research

The present research was a laboratory study of short duration. Future research should be conducted with logographic systems and addressed to such points as:

- 1) the determination of which of the three logographic systems compared in the present study is the most efficacious in a practical situation, such as a classroom over an extended period of time. For example, a study of this nature might transliterate a language program that employs symbols and compare its effect in Carrier-Peak versus Bliss versus Rebus.
- 2) the transfer of what is learned using a logographic text early in reading, to the later reading of T.O. For example, a sample of 30 to 40 rebus symbols could be learned in two or three days and used in a set of readers to teach the rudiments of reading language in print. This might help children match oral language to word units in printed language, and help them become accustomed to many of the language patterns of printed English. Such materials might also aid in learning left-to-right, down-the-page, and page-to-page progression very rapidly.
- 3) the best ways of moving from logograms to T.O., that is, should the move be a gradual phasing in of T.O., or an abrupt shift.

- 4) the question of whether or not the moveable Carrier-Peak symbols are discriminated tactilely in addition to visually.

Chapter 5

SUMMARY

Logographic systems are being utilized more frequently in instruction and research with nonhandicapped and handicapped individuals. Formerly, no comparison among the three most frequently used logographic systems (Carrier-Peak, Bliss, and Rebus) and traditional orthography (T.O.) had been made to investigate which type of system might be easiest to learn.

The purpose of the present study was to compare the ease of learning words represented in the four graphic systems mentioned above. The Carrier-Peak symbols, normally moveable abstract shapes, were converted to graphic form for this study.

Subjects were 36 nonreading boys and girls ranging in chronological age from four years, four months to five years, five months. Mental ages ranged from four years, four months to five years, seven months as measured by the Peabody Picture Vocabulary Test. From a pool of children in four day care centers in a large metropolitan area of the upper midwest, subjects were randomly selected and assigned to one of four experimental conditions, Carrier-Peak, Bliss, Rebus, and T.O. Each condition contained nine subjects.

A sample of 15 words was randomly selected from the pool

of 26 words common to all four graphic systems. The set of 15 words consisted of nouns, main verbs, and prepositions.

The experimental task contained eight levels. At each level the subject was presented a stimulus page and then a response page. On the stimulus page the examiner pointed to a word, said it, and had the subject repeat the word. The stimulus page for the first level had one word. All other stimulus pages had two words. On the response page the subject was required to say each word as the examiner pointed to it. If a word was missed, the subject was corrected. The number of words on a response page from the first level to the eighth level was, respectively: 1, 3, 5, 7, 9, 11, 13, and 15. The number of words correct on the 15-word page was the criterion measure.

Planned orthogonal comparisons were utilized in analyzing the data. Contrasts were made between:

- 1) the three logographic systems (Carrier-Peak, Bliss, and Rebus) and T.O.,
- 2) two partially iconic logographies (Bliss, and Rebus) and a noniconic logography (Carrier-Peak),
- 3) a logography with mostly realistically drawn symbols (Rebus) and one whose symbols are highly stylized (Bliss).

In all three contrasts, significant differences were found. The three logographic systems were significantly easier ($p < .001$) to learn than T.O.; the partially iconic logographies were sig-

nificantly easier ($p < .001$) to learn than the noniconic logography; and the Rebus system was significantly easier ($p < .05$) to learn than the Bliss system.

Previous research has indicated that logographic systems furnish a highly useful tool for learning especially in situations in which T.O. may be less efficient. This includes work with preschool children and handicapped individuals. Results of the present study indicate that partially iconic logographic systems are easier to learn than noniconic systems and thus may be more efficient for certain instructional and communication purposes. Furthermore, the Rebus system may be the most effective system to use with very young children since it was the easiest of the four systems to learn.

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APPENDIX A

Treatment Pages
(Reduced in size)

109

Response Form

Carrier-Peak

Say to the subject:

I AM GOING TO SHOW YOU SOMETHING AND TELL YOU WHAT IT IS. THEN I WANT
YOU TO TELL ME WHAT IT IS.

Turn to page 1.

Point to the word and say:

THIS IS "PLAY." SAY THAT FOR ME. Have the child repeat the word PLAY.

Turn to page 2.



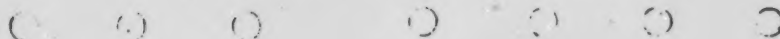
Point to the word and say:

WHAT IS THIS? Child should say the word. If child hesitates more than 3 seconds tell her/him the word. Record the response on the Response Sheet.

Turn to page 3.

play

7



Always point from the child's left to right. Point to the first word and say:

THIS IS "TREE." SAY THAT FOR ME.

Point to the next word and say:

THIS IS "CHAIR." SAY THAT FOR ME.

If child does not respond, repeat the direction.

Turn to page 4.

tree chair ,

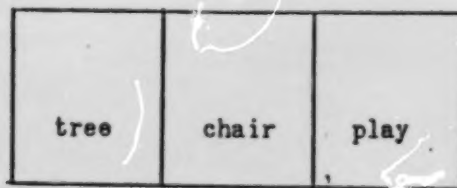
3



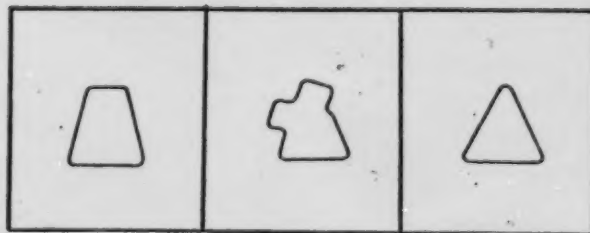
Point to each word (from child's left to right) and say:

WHAT IS THIS? Record each response. (Correct words on examiner's side also run from left to right.)

Turn to page 5.



4.



Continue with the remainder of the task in the same manner as
with previous plates.

floor man



floor	man	chair	play	tree
-------	-----	-------	------	------

				
---	---	---	---	---

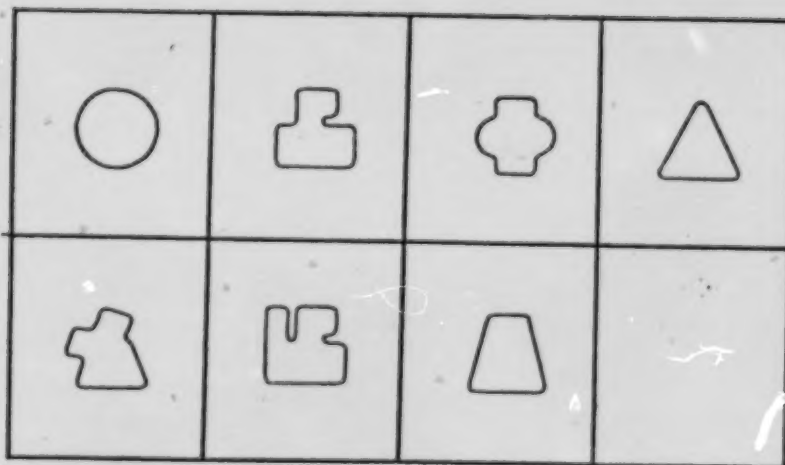
116

lady bird



116

lady	bird	floor	play
chair	man	tree	



118

sit car

6 () () () () () 9.



115

sit	car	man
chair	lady	play
bird	floor	tree

10.

under stand

" (

(

(

(

(

(

(

11.



under	stand		tree	floor
	man	lady	car	
sit	chair	bird	play	

grass on

13.



grass	on	man	stand	lady
car	play	bird	sit	chair
	floor	under	tree	

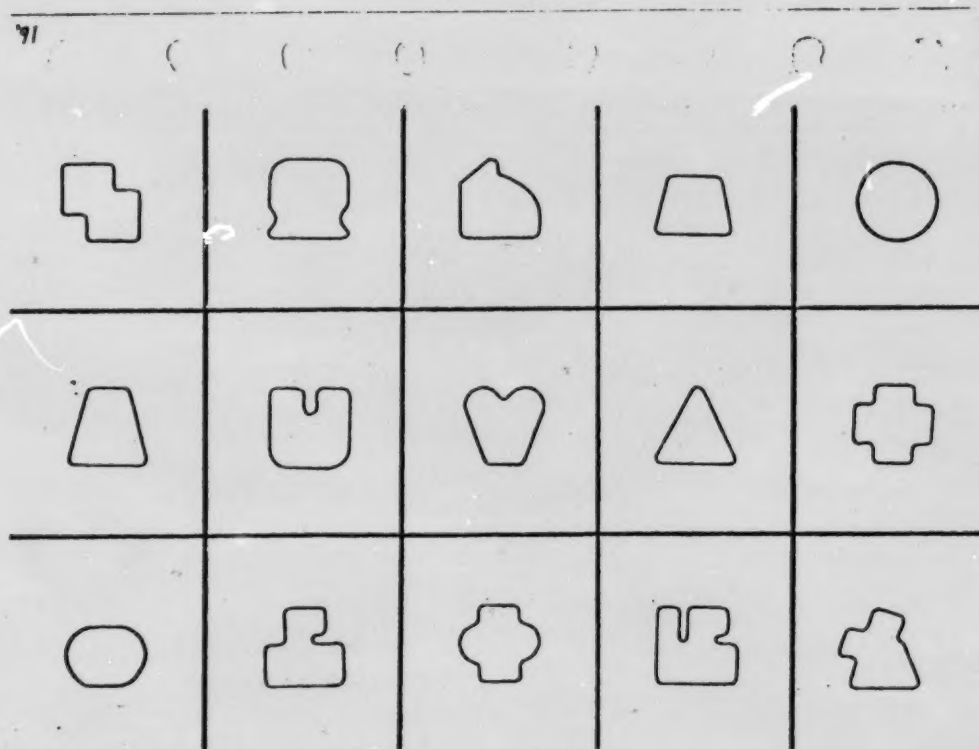
baby bed

15.

15.



baby	bed	under	car	lady
tree	grass	on	play	sit
stand	bird	floor	man	chair



Bliss

Say to the subject:

I AM GOING TO SHOW YOU SOMETHING AND TELL YOU WHAT IT IS. THEN I WANT
YOU TO TELL ME WHAT IT IS.

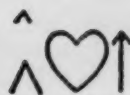
Turn to page 1.

Point to the word and say:

THIS IS "PLAY." SAY THAT FOR ME. Have the child repeat the word PLAY.

Turn to page 2.

" 0 0 0 0 0 0 0 0



Point to the word and say:

WHAT IS THIS? Child should say the word. If child hesitates more than 3 seconds tell her/him the word. Record the response on the Response Sheet.

Turn to page 3.



Always point from the child's left to right. Point to the first

129

word and say:

THIS IS "TREE." SAY THAT FOR ME.

Point to the next word and say:

THIS IS "CHAIR." SAY THAT FOR ME.

If child does not respond, repeat the direction.

Turn to page 4.

tree

chair



Point to each word (from child's left to right) and say:

✓ WHAT IS THIS? Record each response. (Correct words on examiner's side also run from left to right.)

Turn to page 5.

tree	chair	play
------	-------	------

↑	h	^♥↑
---	---	-----

Continue with the remainder of the task in the same manner as
with previous plates.

floor man



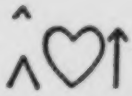
floor	man	chair	play	tree
-------	-----	-------	------	------

☐ _⋈	人	h	^♥↑	↑
----------------	---	---	-----	---

lady bird

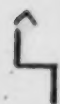


lady	bird	floor	play
chair	man	tree	

alt car

9.



sit	car	man
chair	lady	play
bird	floor	tree

10.

10.

⌒	⊗⊗	Y
h	△	^♥↑
Y	⌒	↑

under stand



under	stand		tree	floor
	man	lady	car	
sit	chair	bird	play	

÷	↑		↑	□
	Y	△	⊗⊗	
↳	H	X	^♥↑	

grass on

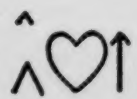
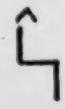
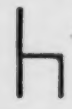
B.

el

✓

grass	on	man	stand	lady
car	play	bird	sit	chair
	floor	under	tree	

14.

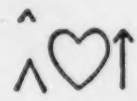
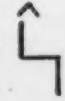
				
				
				

baby bed



α H

baby	bed	under	car	lady
tree	grass	on	play	sit
stand	bird	floor	man	chair

Rebus

Say to the subject:

I AM GOING TO SHOW YOU SOMETHING AND TELL YOU WHAT IT IS. THEN I WANT
YOU TO TELL ME WHAT IT IS.

Turn to page 1.

Point to the word and say:

THIS IS "PLAY." SAY THAT FOR ME. Have the child repeat the word PLAY.

Turn to page 2.

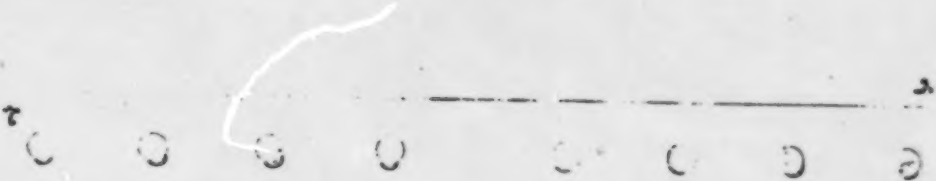
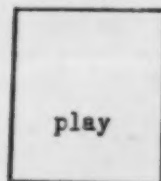
144

Point to the word and say:

145

WHAT IS THIS? Child should say the word. If child hesitates more than 3 seconds tell her/him the word. Record the response on the Response Sheet.

Turn to page 3.



145

146 Always point from the child's left to right. Point to the first word and say:

THIS IS "TREE." SAY THAT FOR ME.

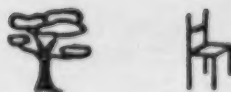
Point to the next word and say:

THIS IS "CHAIR." SAY THAT FOR ME.

If child does not respond, repeat the direction.

Turn to page 4.

tree chair

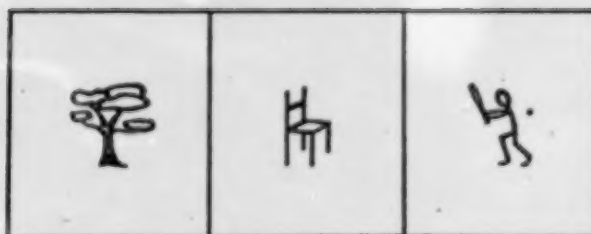


Point to each word (from child's left to right) and say:

WHAT IS THIS? Record each response. (Correct words on examiner's side also run from left to right.)

Turn to page 5.

tree	chair	play
------	-------	------



Continue with the remainder of the task in the same manner as
with previous plates.

floor man



floor	man	chair	play	tree
-------	-----	-------	------	------

				
---	---	---	---	---

lady bird



lady	bird	floor	play
chair	man	tree	

sit car



sit	car	man
chair	lady	play
bird	floor	tree

under stand

u.



under	stand		tree	floor
	man	lady	car	
sit	chair	bird	play	

156

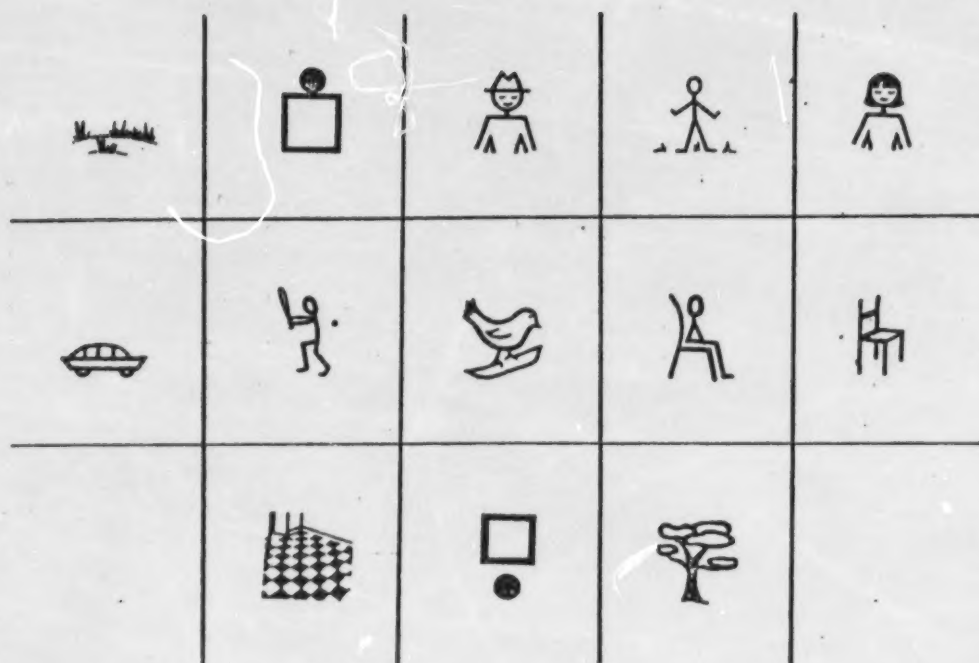
grass on

13.

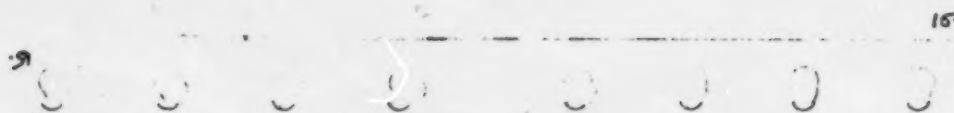


156

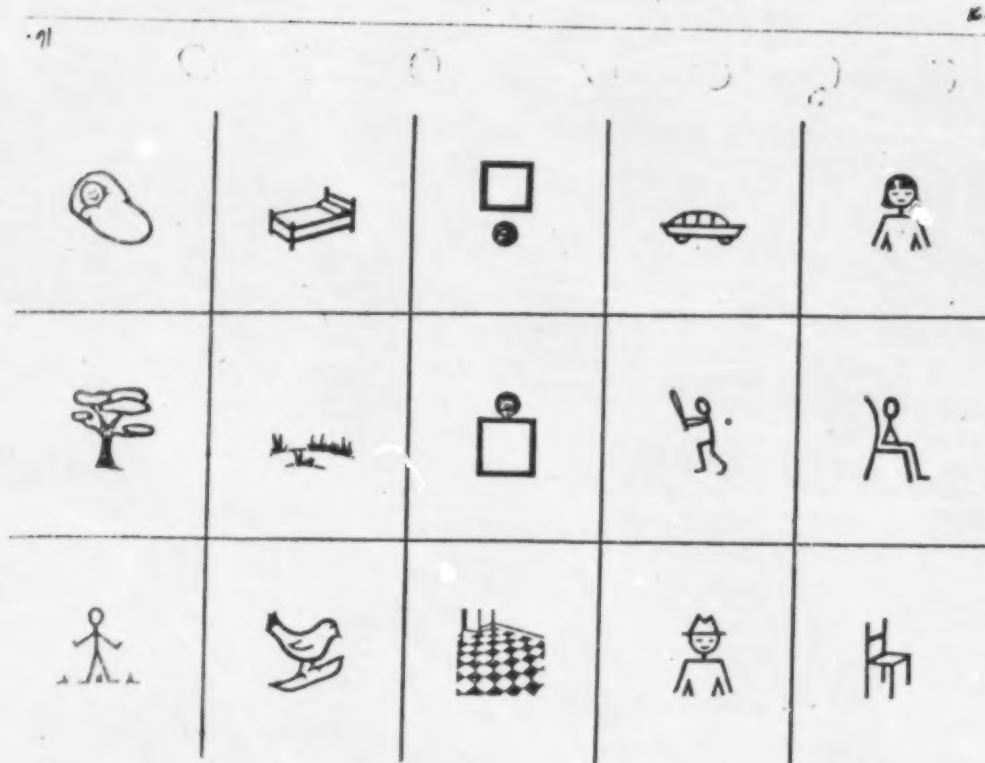
grass	on	man	stand	lady
car	play	bird	sit	chair
	floor	under	tree	



baby bed



baby	bed	under	car	lady
tree	grass	on	play	sit
stand	bird	floor	man	chair



Traditional Orthography

Say to the subject:

I AM GOING TO SHOW YOU SOMETHING AND TELL YOU WHAT IT IS. THEN I WANT
YOU TO TELL ME WHAT IT IS.

Turn to page 1.

Point to the word and say:

THIS IS "PLAY." SAY THAT FOR ME. Have the child repeat the word PLAY.

Turn to page 2.

play

Point to the word and say:

WHAT IS THIS? Child should say the word. If child hesitates more than 3 seconds tell her/him the word. Record the response on the Response Sheet.

Turn to page 3.

play

play

Always point from the child's left to right. Point to the first 163
word and say:

THIS IS "TREE." SAY THAT FOR ME.

Point to the next word and say:

THIS IS "CHAIR." SAY THAT FOR ME.

If child does not respond, repeat the direction.

Turn to page 4.

tree chair

tree chair

Point to each word (from child's left to right) and say:

WHAT IS THIS? Record each response. (Correct words on examiner's side also run from left to right.)

Turn to page 5.

tree	chair	play
------	-------	------

tree	chair	play
------	-------	------

Continue with the remainder of the task in the same manner as
with previous plates.

floor man



floor man

floor	man	chair	play	tree
-------	-----	-------	------	------

floor	man	chair	play	tree
-------	-----	-------	------	------

lady bird

2.

lady bird

lady	bird	floor	play
chair	man	tree	

lady	bird	floor	play
chair	man	tree	

sit car

sit car

sit	car	man
chair	lady	play
bird	floor	tree

sit	car	man
chair	lady	play
bird	floor	tree

under stand

11.

under stand

under	stand		tree	floor
	man	lady	car	
sit	chair	bird	play	

under	stand		tree	floor
	man	lady	car	
sit	chair	bird	play	

grass on

13

grass on

grass	on	man	stand	lady
car	play	bird	sit	chair
	floor	under	tree	

grass	on	man	stand	lady
car	play	bird	sit	chair
	floor	under	tree	

baby bed

15

15

baby bed

baby	bed	under	car	lady
tree	grass	on	play	sit
stand	bird	floor	man	chair

baby	bed	under	car	lady
tree	grass	on	play	sit
stand	bird	floor	man	chair

Name _____ School _____

Date _____ Age _____

Score _____

Treatment _____

1. PLAY _____
2. TREE _____
3. CHAIR _____
4. play _____
5. FLOOR _____
6. MAN _____
7. chair _____
8. play _____
9. tree _____
10. LADY _____
11. BIRD _____
12. floor _____
13. play _____
14. chair _____
15. man _____
16. tree _____
17. SIT _____
18. CAR _____
19. man _____
20. chair _____
21. lady _____
22. play _____
23. bird _____
24. floor _____
25. tree _____

26. UNDER _____
27. STAND _____
28. tree _____
29. floor _____
30. man _____
31. lady _____
32. car _____
33. sit _____
34. chair _____
35. bird _____
36. play _____
38. GRASS _____
39. ON _____
40. man _____
41. stand _____
42. lady _____
43. car _____
44. play _____
45. bird _____
46. sit _____
47. chair _____
48. floor _____
49. under _____
50. tree _____

51. BABY _____
52. BED _____
53. under _____
54. car _____
55. lady _____
56. tree _____
57. grass _____
58. on _____
59. play _____
60. sit _____
61. stand _____
62. bird _____
63. floor _____
64. man _____
65. chair _____